



United States Department of the Interior

FISH AND WILDLIFE SERVICE



New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113
Telephone 505-346-2525 Fax 505-346-2542
www.fws.gov/southwest/es/newmexico/

May 2, 2019

Cons. # 02ENNM00-2017-F-0491

Adam Mendonca, Forest Supervisor
Gila National Forest
Supervisor's Office
3005 East Camino Del Bosque
Silver City, NM 88061

Dear Mr. Mendonca,

Thank you for your June 4, 2018, letter requesting formal conferencing and formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), as amended (ESA), for the implementation of the Luna Restoration Project on the Quemado Ranger District of the Gila National Forest (Forest). Your June 4, 2018, letter included a biological assessment (BA), dated June 2018 and hereby incorporated by reference, which analyzed the effects of implementing a combination of vegetation management and prescribed fire techniques (e.g., mechanical treatment, herbicide treatment, mixed severity and low severity prescribed fire), stream and riparian treatments (e.g., streams crossings, diversions, etc.), and range management improvements (e.g., wells, drinkers, pipelines, etc.) across the 185,586 acre Luna planning area. You also submitted an amendment to your BA, dated September 2018 and hereby incorporated by reference, which analyzed the effects of the proposed action on the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*). In addition, you submitted a further amendment to your BA, dated November 2018 and hereby incorporated by reference, which analyzed the effects of adding an additional 0.2 miles of road conversion to your proposed action.

Within your June 2018 BA, and September 2018 and November 2018 amendments, determinations were made for the endangered Mexican gray wolf (*Canis lupus baileyi*), the threatened Mexican spotted owl (*Strix occidentalis*) and its designated critical habitat, the designated critical habitat for the endangered Southwestern willow flycatcher (*Empidonax traillii extimus*), the threatened narrow-headed gartersnake (*Thamnophis rufipunctatus*) and its proposed critical habitat, the endangered loach minnow (*Tiaroga cobitis*) and its designated critical habitat, the endangered spikedace (*Meda fulgida*) and its designated critical habitat, and the endangered New Mexico meadow jumping mouse.

The Forest determined that the proposed action “may affect, is not likely to jeopardize” the Mexican gray wolf and “may affect, is not likely to adversely affect” the spikedace and the New Mexico meadow jumping mouse.

The Service concurs with your determination of “may affect, is not likely to jeopardize” for the Mexican gray wolf. The Service bases this conclusion on the implementation of temporary restrictions for project activities to avoid disturbance near a wolf den or rendezvous site during the breeding season. In addition, the Service bases this conclusion on the commitment to coordinate with the Mexican Wolf Field Team to minimize or eliminate adverse effects to any denning packs in the project area.

The Service concurs with your determination of “may affect, is not likely to adversely affect” for the spikedace. The Service bases this conclusion on the low likelihood that spikedace are present within the action area and the implementation of conservation measures to reduce the potential for adverse effects should spikedace be located in the action area. The low likelihood of occurrence is based on negative survey data from New Mexico Department of Game and Fish and Arizona Game and Fish Department permit reports (NMDGF 2015, AZGFD 2013).

The Service concurs with your determination of “may affect, is not likely to adversely affect” for the New Mexico meadow jumping mouse. The Service bases this conclusion on the low likelihood that jumping mice are found throughout the action area and the implementation of conservation measures (e.g., active season restrictions) to reduce the potential for adverse effects. The low likelihood of occurrence is based on negative track plate survey data from September 2018 and the historical lack of presence within the action area (Forest Service 2018). In addition, the Forest has committed to re-initiation of consultation should jumping mice be located within the action area following additional surveys in 2019.

The Forest determined that the proposed action “may affect, is likely to adversely affect” the Mexican spotted owl and its designated critical habitat, the designated critical habitat for the Southwestern willow flycatcher, the narrow-headed gartersnake, the loach minnow and its designated critical habitat, and the designated critical habitat for the spikedace. The Forest also requested formal conferencing for the narrow-headed gartersnake proposed critical habitat with a determination of “may affect, is likely to adversely affect”.

The attached biological opinion (BO) and conference opinion (CO) is based on our review of the proposed action and its effects on the Mexican spotted owl and its designated critical habitat, the designated critical habitat for the Southwestern willow flycatcher, the narrow-headed gartersnake and its proposed critical habitat, the loach minnow and its designated critical habitat, and the designated critical habitat for the spikedace, in accordance with Section 7 of the ESA. The BO and CO is based on information provided in the June 2018 biological assessment, the November 2018 amendment to the BA, correspondence with your staff, data in our files, a literature review, and other sources of information including the final and proposed rules, where applicable, to list each of the species listed above and designate their respective critical habitat. Literature cited in the attached biological opinion and conference opinion is not a complete bibliography of all

literature available on the species of concern, the project and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at the New Mexico Ecological Services Field Office.

The Service appreciates your efforts to identify and minimize effects to listed species from implementing the Luna Restoration Project on the Quemado Ranger District of the Gila National Forest. For further information, please contact Mary Susan Pruitt at 505-761-4707 or mary_pruitt@fws.gov. Please refer to the consultation number, 2017-F-0491, in future correspondence concerning this project.

Sincerely,



Jodie Mamuscia
Acting Field Supervisor

cc (electronic):

Forest Biologist, Gila National Forest, Silver City, NM

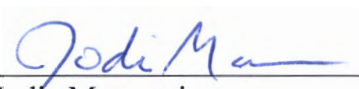
District Biologist, Quemado Ranger District, Gila National Forest, Quemado, NM

Director, New Mexico Department of Game and Fish, Santa Fe, NM

Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division,
Santa Fe, NM

**BIOLOGICAL OPINION FOR IMPLEMENTATION OF THE LUNA RESTORATION
PROJECT ON THE QUEMADO RANGER DISTRICT OF THE GILA NATIONAL
FOREST**

May 2019



Jodie Mamuschia
Acting Field Supervisor
New Mexico Ecological Services Field Office



Date

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INTRODUCTION

This document constitutes the U.S. Fish and Wildlife Service's (Service) biological opinion and conference opinion based on our review of the implementation of the Luna Restoration Project on the Quemado Ranger District of the Gila National Forest (Forest) and its effects on the threatened Mexican spotted owl (*Strix occidentalis*) and its designated critical habitat, the designated critical habitat for the endangered Southwestern willow flycatcher (*Empidonax traillii extimus*), the threatened narrow-headed gartersnake (*Thamnophis rufipunctatus*) and its proposed critical habitat, the endangered loach minnow (*Tiaroga cobitis*) and its designated critical habitat, and designated critical habitat for the endangered spikedace (*Meda fulgida*), in accordance with section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq.), as amended (ESA).

A biological opinion is a document that states the opinion of the Service as to whether a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. "*Jeopardize the continued existence of*" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02). "*Destruction or adverse modification*" is defined as a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the primary constituent elements (PCEs) that are essential to the conservation of a species or that preclude or significantly delay development of such elements (50 CFR § 402.02; 81 FR 7214-7226). Please note that PCEs of critical habitat are now referred to as physical and biological features (PBFs) based on the final rule implementing changes to regulations for designating critical habitat (81 FR 7414-7440; Service 2016). However, to maintain consistency with the final and proposed rules designating critical habitat for the Mexican spotted owl, Southwestern willow flycatcher, narrow-headed gartersnake, loach minnow, and spikedace, this biological opinion will use the term PCE.

In your biological assessment (BA) dated June 2018, the Forest determined that the proposed action "may affect, is likely to adversely affect" the Mexican spotted owl and its designated critical habitat, the designated critical habitat for the Southwestern willow flycatcher, the narrow-headed gartersnake, the loach minnow and its designated critical habitat, and the designated critical habitat for the spikedace. The Forest also requested formal conferencing for the narrow-headed gartersnake proposed critical habitat with a determination of "may affect, is likely to adversely affect".

This biological opinion and conference opinion is based on information provided in the June 2018 biological assessment, November 2018 amendment to the BA, correspondence with your staff, data in our files, a literature review, and other sources of information including the final and proposed rules, where applicable, to list each of the species listed above and designate their respective critical habitat (Service 1986, 1988, 1993, 1997, 2004, 2012, 2014). Literature cited in this biological opinion and conference opinion is not a complete bibliography of all literature available on the species of concern, the project and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at the New Mexico Ecological Services Field Office.

CONSULTATION HISTORY

A detailed consultation history for this proposed action is provided in Table 1.

Table 1. Summary of the consultation history for the proposed action.

Date	Event
October 10, 2017	Forest biologist, interdisciplinary team leader, and district ranger met with Service biologists and staff from the New Mexico Ecological Services Field Office (NMESFO) to begin coordination.
January 2018	Forest staff contacted Ronald Maes and Susan Pruitt regarding review of draft Biological Assessment (BA).
February 2018	Forest staff contacted Shaula Hedwall in reference to providing samples of Mexican Spotted Owl monitoring plans for treatments in Protected Activity Centers.
March 28, 2018	Draft BA was sent to Ronald Maes and Susan Pruitt; comments were returned at the end of April and beginning of May.
July 2, 2018	Request from NMESFO for GIS shapefiles was sent to Forest.
July 20, 2018	Forest sent requested GIS shapefiles to NMESFO.
July 23, 2018	Request for clarification of effects determinations for narrow-headed gartersnake and spokedace was sent to Forest; Forest responded with requested clarification for gartersnake.
August 3, 2018	Forest responded with requested clarification for spokedace.
September 20, 2018	Forest submitted an amendment to the BA to include an analysis of effects to the New Mexico meadow jumping mouse.
October 10, 2018	Forest sent additional GIS shapefiles to NMESFO to support analysis for the jumping mouse, along with additional information on prescribed burning.
October 29, 2018	Phone conversation between Service biologist, Susan Pruitt, and Forest Service biologist, Timothy Hendricks, indicated that the Forest would be submitting an additional amendment to the BA to include an alteration to the proposed action based on NEPA planning conversations.
November 5, 2018	Forest submitted an amendment to the BA to include an alteration to the proposed action.
February 13, 2019	Service sent draft biological opinion and conference opinion to Forest Service for review.
March 25, 2019	Forest Service sent comments on draft biological opinion and conference opinion to Service.

DESCRIPTION OF PROPOSED ACTION

Description of Proposed Action

The June 2018 biological assessment (BA) and November 2018 amendment to the BA prepared by the Gila National Forest (Forest) describes the proposed implementation of the Luna Restoration Project in detail and is incorporated here by reference. The Forest is proposing to implement ecological restoration treatments across an 185,586 acre planning area along the western portion of the Quemado Ranger District around the community of Luna (Figure 1). This area includes approximately 14,225 acres of private land and approximately 23,228 acres designated as “roadless areas”. Implementation is estimated to begin in 2019, with initial treatments beginning across the project area over the next 8 to 10 years and extending 20 years or until objectives are met, including maintenance.

The purpose of the Luna Restoration Project is to create and maintain healthy, resilient landscapes and watersheds by implementing vegetation and watershed restoration treatments, improving rangeland habitat, and reducing the potential for high severity fire. The Forest utilized both vegetation modeling and fire modeling during planning, which helped to inform the types and locations of various treatments in order to meet the purposes of the project. The Forest is proposing to implement vegetation treatments (e.g., mechanical treatments, grassland treatments, herbicide treatments), prescribed fire treatments (e.g., mixed severity, low severity), stream and riparian treatments (e.g., streams crossings, diversions, etc.), and range management improvements (e.g., wells, storage tanks, pipelines, etc.),

Vegetation Treatments

Vegetation treatments to be implemented include: 73,856 acres of mechanical treatment in woodland (i.e., juniper and pinyon pine) and forested (i.e., ponderosa pine and mixed conifer) areas to decrease canopy cover; 23,125 acres of grassland treatments to remove encroaching trees; and approximately 20,283 acres of herbicide treatments to remove rabbitbrush and alligator juniper (Figure 2).

Prescribed Fire Treatments

Prescribed fire treatments will be implemented over a total of 36,022 acres, with 11,996 acres of mixed severity prescribed fire and 24,026 acres of low severity prescribed fire. The mixed severity prescribed fire is proposed to treat natural fuels (e.g., both dead and live vegetation currently present on the landscape) and activity fuels (e.g., limbs and other materials from thinning projects) with the desired result of producing a highly variable pattern of mortality across the landscape to foster the development of diverse communities. The low severity prescribed fire is proposed for areas of steep topography with the desired result of reducing surface and canopy fuels. In some locations, prescribed fire will be utilized in combination with vegetation treatments, while other areas will be treated by prescribed fire only (Figure 2).

Stream and Riparian Treatments

Stream and riparian treatments to be implemented include: 10 motorized route stream crossings, 1 irrigation diversion improvement, 4 livestock/wildlife exclosures, 2 motorized vehicle barriers, 2 riparian plantings, maintenance of 157 erosion control features, multiple sites of seeding, multiple stream and bank stabilization structures within 9 streams, and 2 locations for placement of surface erosion gravel (Table 2, Figure 3).

The motorized stream crossings will be constructed along Dry Blue Creek, the Head of Ditch Campground, and several other road crossings. They will consist of interlocking concrete blocks, concrete planks, pre-fabricated bridges, rock rip-rap, or other engineered design. The installation of these stream crossings will require motorized equipment and potentially a helicopter for delivery of materials. The irrigation diversion improvement will occur at the Head of Ditch Campground and will consist of a permanent diversion facility and a sediment retention pool upstream of the facility. The exclosure fences constructed will exclude both wildlife and livestock while the proposed riparian, stream, and bank restoration projects are becoming established. The motorized vehicle barriers will be constructed using a hand drill rig for digging post holes. Riparian planting will occur in order to provide bank stabilization, improve water temperature, and enhance overall water quality. Numerous erosion control features currently exist within the planning area and will require maintenance ranging from removing accumulated sediment to repairing and replacing breeched sections. Seeding will be accomplished using hand or trailer type seeders. Stream and bank stabilization structures may be constructed out of on-site native material, rock rip-rap, rock weirs, bendway weirs, wooded material or rock and wire rip-rap. Surface erosion gravel would be placed using heavy equipment.

Range Management Improvements

The proposed action also includes the development and maintenance of water systems on the Centerfire, Luna, Spur Lake, Mangitas, and Dillman/Trout Creek allotments. Across these allotments, the Forest is proposing a total of 11 wells, 13 storage tanks, 24 drinkers, 2 trick tanks, 16 miles of pipeline, and 2.25 miles of fence (Table 3, Figure 3).

The installation of new wells is contingent upon the ability of the Forest to meet the requirements of the New Mexico Office of the State Engineer. Storage tanks will have a capacity of approximately 10,000 gallons of water, and drinkers or trick tanks will have a capacity between 3,000-5,000 gallons of water. All pipelines proposed would be buried and all proposed fence construction/reconstruction will be wildlife compatible. A pasture division fence is proposed on the Spur Lake allotment. Implementation of these proposed improvements will require motorized equipment, ranging from ATV/UTVs to large trucks to small dozers. In addition, the proposed action includes 116 miles of road decommissioning, some temporary road construction, and various types of road re-designation (Table 4).

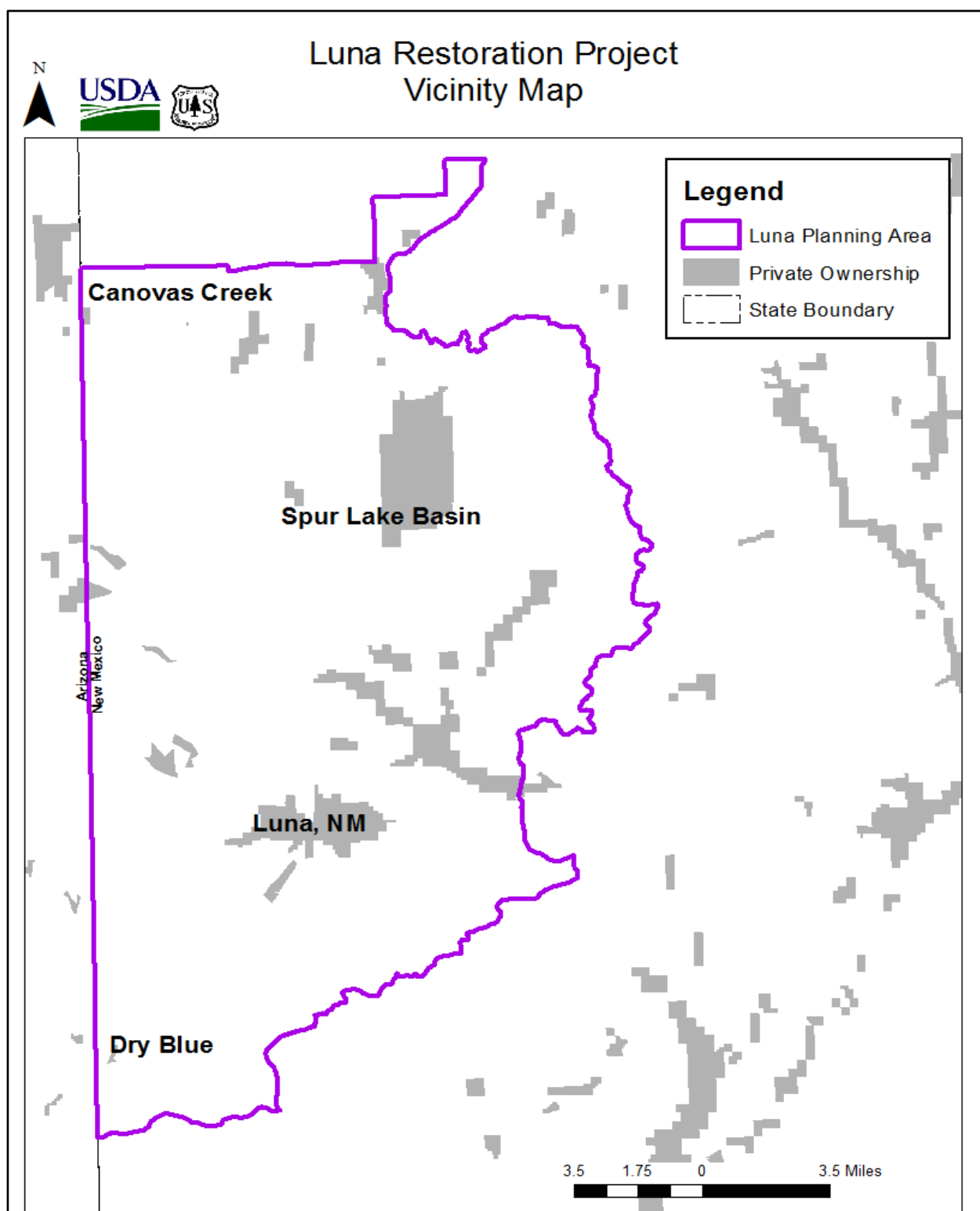


Figure 1. Luna Restoration planning area on the Quemado District of the Gila National Forest.

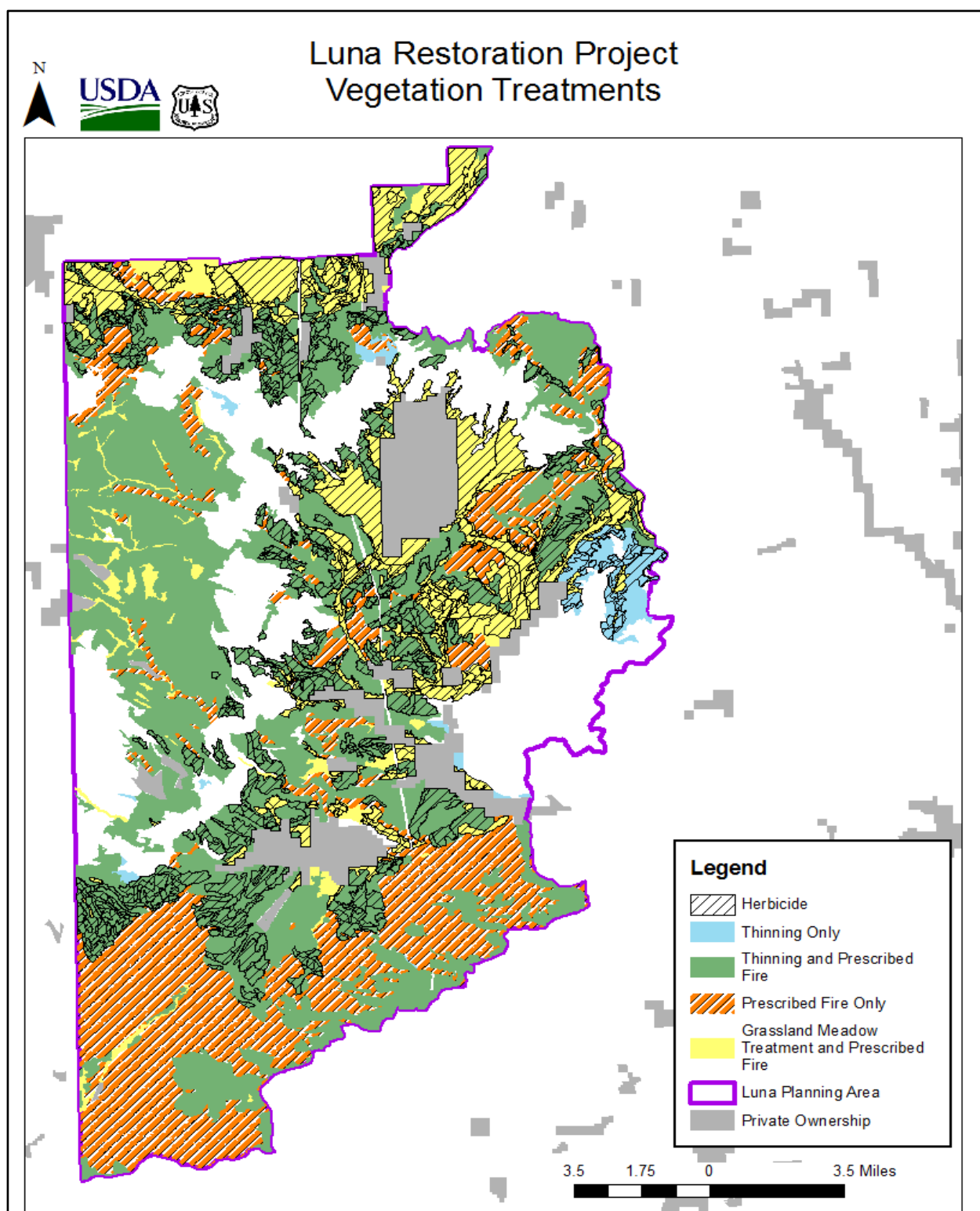


Figure 2. Vegetation treatments and prescribed fire treatments for the Luna Restoration Project.

Table 2. Stream and riparian treatments for the Luna Restoration Project.

Type of Work	Number	Location
Motorized Route Stream Crossing Improvement	10	FSR882 Head of Ditch CG; Dry Blue Trail #61 (6 crossings); County Road B-012; FSR4127U; LATV-9
Irrigation Diversion Improvement	1	Luna Ditch Diversion point at Head of Ditch Campground
Livestock/Wildlife Exclosure	4	Stone Creek Centerfire Creek Spur Lake Draw Adair Spring
Barriers to Prevent Motorized Use	2	Construct motor vehicle barriers at Frieborn Trail and Blue Spring Trail
Riparian Planting	2	Centerfire Creek, Spur Lake Draw
Erosion Control Maintenance	157	Existing earthen erosion control features located across the planning area
Seeding	Multiple Sites	Spur Lake Draw
Stream and bank structures	9 streams, multiple structures within each stream	Instream structures and/or bank stabilization: Bishop Canyon, Romero Creek, Dry Blue, Pace Creek, Centerfire Creek, Stone Creek, Spur Lake Draw, Jenkins Creek, Canovas Creek
Surface erosion reduction	2 Sites	Head of the Ditch Campground roads; Trout Creek dispersed camping area

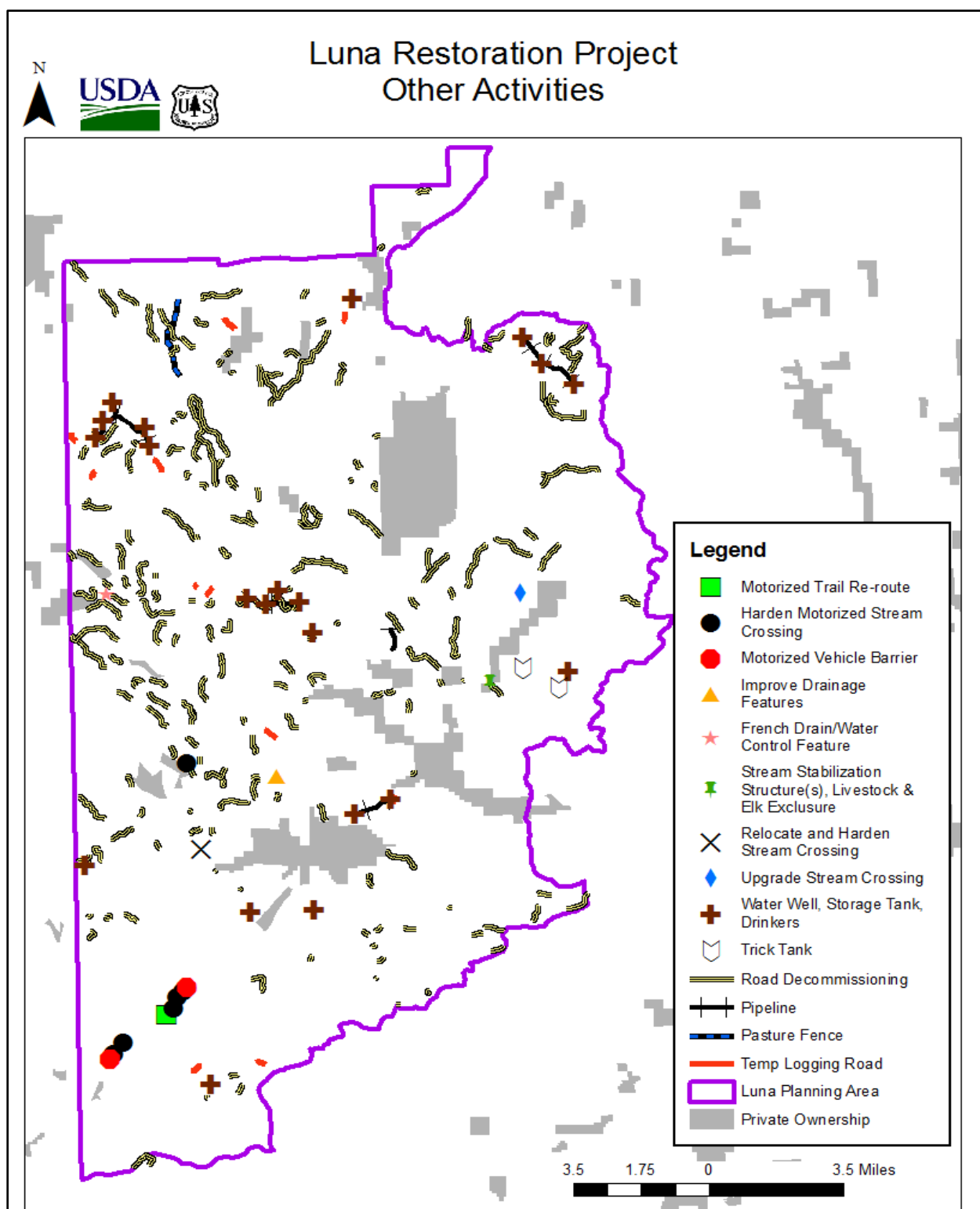


Figure 3. Stream and riparian treatments, range improvements, and road work for the Luna Restoration Project.

Table 3. Range improvements for the Luna Restoration Project.

Allotment	Pasture	Rangeland improvement description
Centerfire	SA Pasture	Bury .75 miles of existing pipeline.
Centerfire	Centerfire	Drill and equip 1 new well and install 1 storage tank and 1 drinker*.
Centerfire	Freeman Mountain	Install 2 new trick tanks.
Centerfire	Freeman	Drill and equip 1 new well and install 1 storage tank and 1 drinker*.
Dillman/Trout Creek	Mesa	Drill and equip 1 new well and install 1 storage tank, 2 drinkers*, and 1 mile of pipeline.
Luna	Hy Clark	Install 1 storage tank, 2 drinkers* and 1.25 miles of pipeline. Drill and equip 1 new well in section 12.
Luna	Sawmill, Kiehne, Adair	Drill and equip 1 new well and install 2 storage tanks, 4 drinkers*, and 2.75 miles of pipeline.
Luna	Stone Creek	Drill and equip 1 new well and install 1 storage tank, 2 drinkers*, and .75 miles of pipe.
Luna	Dry Blue	Drill and equip 1 new well and install 1 storage tank, 4 drinkers*, and 2.5 miles of pipeline.
Mangitas	Jones	Drill and equip 1 new well and install 1 storage tank, 2 drinkers*, and .5 miles of pipeline.
Spur Lake	Canovas	Install 2.25 miles of pasture division fence.
Spur Lake	Black Peak	Drill and equip 1 new well and install 1 storage tank, 2 drinkers*, and 2 miles of pipeline.
Spur Lake	SA	Drill and equip 1 new well and install 1 storage tank, 3 drinkers*, and 2 miles of pipeline.
Spur Lake	Jenkins Creek	Drill and equip 1 new well and install 1 storage tank, 3 drinkers*, and 2.5 miles of pipeline.

*Additional storage tanks may be placed with drinkers, if needed, to improve functionality of water systems. All wells will require the acquisition of water rights.

Table 4. Treatments to motorized transportation system for the Luna Restoration Project. Italicized treatments represent administrative actions that will be taken by the Gila National Forest.

Transportation Treatments	Miles
Road decommissioning	116
<i>Change Admin/Written Authorization road segments from open to decommissioned (Tucson Electric Power) (miles subset of decommissioning)</i>	<i>1.7</i>
Leave horse, hiking/foot trail tread during decommissioning of roads	4.23
Reopen maintenance level 1 closed roads for administrative or permitted use for proposed treatment activities and close or decommission after activities are completed	34.5
<i>Maintenance Level 1 Administrative or permitted use roads to be <u>closed</u> after activities completed</i>	<i>22.6</i>
<i>Maintenance Level L1 Administrative or permitted use roads to be <u>decommissioned</u> after activities completed (miles are subset of total road decommissioning)</i>	<i>12</i>
Add user created route and designate as administrative use or written authorization only (Tucson Electric Power)	0.5
Construct Temporary Roads - obliterate after vegetation treatments are completed	3-5
Reopen closed roads for periodic administrative use or written authorization only (Tucson Electric Power)	3.5
Reopen NFS maintenance level 1 closed roads to open to all motor vehicle types	14.0
Add user created routes and designated as NFS roads open to all motor vehicle types	4.2
Construct motorized 4x4 trail (Dillman Creek Re-route)	0.3

Conservation Measures

The following conservation measures for the Mexican spotted owl, gartersnake, and loach minnow are included in the proposed action. Conservation measures for the Mexican gray wolf, Southwestern willow flycatcher, and spikedace are located in Appendix A.

Mexican spotted owl

- All activities proposed to occur within PACs will either occur outside of the breeding season (March 1-August 31) or non-breeding must be inferred or determined for that year based on the 2012 Mexican Spotted Owl Survey Protocol (as identified in the 2012 Mexican Spotted Owl Recovery Plan; Service 2012a).
- Where stands meet vegetation thresholds (minimum desired conditions), as identified in the 2012 Mexican Spotted Owl Recovery Plan (Table C.3., pg. 278, Service 2012a), stands will not be treated in such a way as to lower conditions below these thresholds.
- Key owl habitat elements will be retained to the degree possible during activities that may impact them. Key habitat elements include hardwoods, snags, large trees, and large woody debris.

Narrow-headed gartersnake

- All equipment that will enter the water of Dry Blue Creek or the San Francisco River will be steam-cleaned prior to use.
- No fuel or oil will be stored within the floodplain.
- Surveys on Dry Blue Creek and the San Francisco River at stream crossing sites and the diversion site will be completed prior to implementation of the projects. Surveys will be coordinated with the narrow-headed gartersnake lead biologist of the New Mexico Ecological Services Field Office.
- If narrow-headed gartersnakes are detected during surveys, the Forest Service will contact the Service prior to implementation of activities within proposed critical habitat.
- Bank disturbance will be minimized to only what is needed to shape the banks where the motorized trail crossings occur and where the proposed irrigation diversion improvement is planned.
- Any riparian vegetation that is disturbed during implementation will be replaced with native riparian species after the project work is completed.
- Disturbed areas will be seeded with native species after the project work is completed.
- Riparian buffers will be established based on Forest Service best management practices to minimize sediment movement from any project work that occurs adjacent to riparian and stream habitat.
- The irrigation diversion improvement project and road realignment project located at the Head of Ditch Campground along the San Francisco River will be implemented during low flow periods.

Loach minnow

- All equipment that will enter the water of Dry Blue Creek or the San Francisco River will be steam cleaned prior to use.
- No fuel or oil will be stored within the floodplain.
- Block nets will be installed approximately 60 feet upstream and 60 feet downstream from the center of the project footprint before project implementation and will remain in place

during all in-stream construction activities to exclude fish and other aquatic animals from entering the Action Area.

- These block nets will be set up and all fish removed from the site and placed upstream prior to implementing the motorized trail crossing improvement work.
 - o Immediately prior to electrofishing, the conductivity of the water will be taken, and the backpack shocker settings will be adjusted accordingly.
 - o The electrofishing shall be done with a backpack shocker, dip nets, and seines.
 - o All electrofishing will be conducted downstream (from the downstream block net to the upstream block net) using multiple pass methodology for a minimum of 3 passes or until no loach minnow are detected, but not more than 6 passes.
 - o All captured fish should be placed in a bucket with water and observed. If fish are not behaving normally and upright after being placed in the bucket, the settings of the shocker should be re-adjusted.
 - o All fish will be released to areas of suitable habitat upstream of the Action Area.
- Bank disturbance will be minimized to only what is needed to shape the banks where the motorized trail crossings occur and where the proposed irrigation diversion improvement is planned.
- The District Biologist or Forest Fishery Biologist will be present during implementation of the motorized trail crossing work to make sure that block nets remain in place and disturbance is minimized.
- Any riparian vegetation that is disturbed during implementation will be replaced with native riparian species after the project work is completed.
- Disturbed areas will be seeded with native species after the project work is completed.
- Riparian buffers will be established based on Forest Service best management practices to minimize sediment movement from any project work that occurs adjacent to riparian and stream habitat.
- The irrigation diversion improvement project and road realignment project located at the Head of Ditch Campground along the San Francisco River will be implemented during low flow periods. The San Francisco River downstream of this location typically becomes dewatered during a portion of the year and sediment produced by the project would not make it to designated critical habitat 13 miles downstream.

Description of Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment. For the proposed action, the action area includes all areas proposed for some type of treatment (e.g., vegetation, prescribed fire, stream and riparian, range improvements, etc.) on the Quemado Ranger District of the Gila National Forest, which equals approximately 185,586 acres. The action area may also extend to areas downstream of the project area where water quality and quantity may be affected by the proposed action. Impacts associated with noise and smoke that result from project activities are also included in the action area and typically expand beyond the project boundaries.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components in our evaluation for each species: (1) the Status of the Species, which evaluates the species' range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and, (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the species and the role of the action area in the survival and recovery of the species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: 1) the Status of Designated Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the species in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the designated critical habitat overall; 2) the Environmental Baseline, which evaluates the condition of the designated critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how they will influence the recovery role of affected designated critical habitat units; and, 4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs, and how they will influence the recovery role of affected designated critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the designated critical habitat are evaluated in the context of the condition of the designated critical habitat unit, taking into account any cumulative effects, to determine if the

designated critical habitat unit would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the species.

STATUS OF SPECIES AND CRITICAL HABITAT

Mexican Spotted Owl (MSO)

The MSO was listed as a threatened species on March 16, 1993 (Service 1993) and its critical habitat was designated on August 31, 2004 (Service 2004). The Service appointed the MSO Recovery Team in 1993 (Service 1993), which produced the Recovery Plan for the MSO in 1995 (Service 1995a). The Service released the final MSO Recovery Plan, First Revision (Recovery Plan) in December 2012 (Service 2012a). Hereafter, the Mexican spotted owl may be referred to as MSO, spotted owl, or owl.

Description and Life History

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl is found in the Final Rule listing the owl as a threatened species (Service 1993), the original Recovery Plan (Service 1995a), and in the revised Recovery Plan (Service 2012a). The information provided in those documents is included herein by reference.

Habitat Requirements and Distribution

The spotted owl occurs in forested mountains and canyonlands throughout the southwestern United States and Mexico (Gutierrez et al. 1995). It ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas south into several States of Mexico. Although the owl's entire range covers a broad area of the southwestern United States and Mexico, it does not occur uniformly throughout its range. Instead, the Mexican spotted owl occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Known owl locations indicate that the species has an affinity for older, uneven-aged forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

In addition to this natural variability in habitat influencing owl distribution, human activities also vary across the owl's range. The combination of natural habitat variability, human influences on owls, international boundaries, and logistics of implementation of the Recovery Plan necessitates subdivision of the owl's range into smaller management areas. The 1995 Recovery Plan subdivided the owl's range into 11 "Recovery Units" (RUs): six in the United States and five in Mexico. In the first revision of the Recovery Plan, we renamed RUs as "Ecological Management Units" (EMUs) to be in accord with current Service guidelines. We divided the Mexican spotted owl's range within the United States into five EMUs: Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West (BRW), and Basin and Range-East (BRE). Within Mexico, the Revised Recovery Plan delineated five EMUs: Sierra Madre Occidental Norte, Sierra Madre Occidental Sur, Sierra Madre Oriental Norte, Sierra Madre Oriental Sur, and Eje Neovolcanico.

Mexican spotted owl surveys since the 1995 Recovery Plan have increased our knowledge of owl distribution, but not necessarily of owl abundance. Population estimates, based upon owl surveys, recorded 758 owl sites from 1990 to 1993, and 1,222 owl sites from 1990 to 2004 in the United States. The revised Recovery Plan (Service 2012a) lists 1,324 known owl sites in the United States. An owl site is an area used by a single or a pair of adult or subadult owls for nesting, roosting, or foraging. The increase in number of known owl sites is mainly a product of new owl surveys being completed within previously unsurveyed areas (e.g., several National Parks within southern Utah, Grand Canyon National Park in Arizona, Guadalupe National Park in West Texas, Guadalupe Mountains in southeastern New Mexico and West Texas, Dinosaur National Monument in Colorado, Cibola National Forest in New Mexico, and Gila National Forest in New Mexico). Thus, an increase in abundance in the species range-wide cannot be inferred from these data (Service 2012a). However, we do assume that an increase in the number of areas considered occupied is a positive indicator regarding owl abundance.

Threats

Two primary reasons were cited for listing the Mexican spotted owl in 1993: (1) the historical alteration of its habitat as the result of timber-management practices; and, (2) the threat of these practices continuing. The impacts associated with stand-replacing fire were also cited as a looming threat at that time. Since publication of the original Recovery Plan (Service 1995a), we have acquired new information on the biology, threats, and habitat needs of the Mexican spotted owl. Threats to its population in the U.S. (but likely not in Mexico) have transitioned from commercial-based timber harvest to the risk of stand-replacing wildland fire (Service 2012a).

Recent forest management has moved away from a commodity focus and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl. However, as stated in the revised Recovery Plan (Service 2012a), there is much uncertainty regarding thinning and burning treatment effects and the risks to owl habitat with or without forest treatment as well. Therefore, efforts to reduce fire risk to owls should be designed and implemented to evaluate the effects of treatments on owls and retention of or movement towards desired conditions.

Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present, than prior to 1995. Climate variability combined with unhealthy forest conditions may also synergistically result in increased negative effects to habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat. Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites.

Historical and current anthropogenic uses of Mexican spotted owl habitat include domestic livestock grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout the range of the owl and is thought to have a negative effect on the availability of grass cover for prey species. Recreation impacts are increasing throughout the Southwest, especially in meadow and riparian areas.

There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Although, use of sites near heavy recreational use and successful breeding and fledging are indications the owls can acclimate to this type of activity. Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to owls through habitat modification and disturbance. As the human population grows in the southwestern United States, small communities within and adjacent to wildlands are being developed. This trend may have detrimental effects to spotted owls by further fragmenting habitat and increasing disturbance during the breeding season.

Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites. For example, West Nile Virus also has the potential to adversely impact the Mexican spotted owl. The virus has been documented in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney et al. 2004). Unfortunately, due to the secretive nature of spotted owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its impact to the owl rangewide.

Currently, high-severity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic wildland fire is probably the greatest threat to the Mexican spotted owl within the action area. As throughout the West, fire severity and size have been increasing within this geographic area. Landscape-level wildland fires, such as the Rodeo-Chediski Fire (2002), the Wallow Fire (2011), and the Whitewater-Baldy Complex (2012) have resulted in the loss of tens of thousands of acres of occupied and potential nest/roost habitat across significant portions of the Mexican spotted owl's range. Although owls will forage in burned areas and, at times, nest and successfully fledge (USDA Forest Service 2016), the long-term effects to roosting and nesting habitat by stand-replacing wildfire are unknown.

Finally, global climate variability may also be a threat to the owl. Changing climate conditions may interact with fire, management actions, and other factors discussed above, to increase impacts to owl habitat. Studies have shown that since 1950, the snowmelt season in some watersheds of the western U.S. has advanced by about 10 days (Dettinger and Cayan 1995, Dettinger and Diaz 2000, Stewart et al. 2004). Such changes in the timing and amount of snowmelt are thought to be signals of climate-related change in high elevations (Smith et al. 2000, Reiners et al. 2003). The impact of climate change is the intensification of natural drought cycles and the ensuing stress placed upon high-elevation montane habitats (IPCC 2007, Cook et al. 2004, Breshears et al. 2005, Mueller et al. 2005). The increased stress put on these habitats is likely to result in long-term changes to vegetation, and to invertebrate and vertebrate populations within coniferous forests and canyon habitats that affect ecosystem function and processes.

Summary

Overall, the status of the owl has not changed significantly range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas) since listing in 1993. That is, the distribution of owls continues to cover the same area, and critical habitat is

continuing to provide for the life history needs of the Mexican spotted owl throughout all of the EMUs located in the U.S. We do not have detailed information regarding the status of the Mexican spotted owl in Mexico, so we cannot make inferences regarding its overall status.

However, this is not to say that significant changes have not occurred within the owl's U.S. range. Wildland fire has resulted in the greatest loss of PACs and critical habitat relative to other actions (e.g., such as forest management, livestock grazing, recreation, etc.) throughout the U.S. range of the Mexican spotted owl. These wildland fire impacts have mainly impacted Mexican spotted owls within the UGM EMU (e.g., Slide and Schultz Fires on the Coconino NF, Rodeo Chediski and Wallow Fires on the Apache-Sitgreaves NF and Whitewater-Baldy Complex on the Gila NF) and BRW EMU (e.g., Horseshoe 2 Fire on the Coronado NF); but other EMUs have been impacted as well (SRM EMU, the Santa Fe NF by the Las Conchas Fire, CP EMU by the Warm Fire). However, we do not know the extent of the effects of these wildland fires on actual owl numbers.

Mexican Spotted Owl Designated Critical Habitat

The Service designated critical habitat for the Mexican spotted owl in 2004 on approximately 3.5 million hectares (ha) (8.6 million acres (ac)) of Federal lands in Arizona, Colorado, New Mexico, and Utah (Service 2004). Within the designated boundaries, critical habitat includes only those areas defined as protected and restricted habitats in the 1995 Mexican Spotted Owl Recovery Plan (Service 1995a). Protected habitat is defined as Protected Activity Centers (PACs) and unoccupied slopes >40 percent in the mixed conifer and pine-oak forest types that have not had timber harvest in the last 20 years, and all legally and administratively reserved lands (e.g., wilderness). Restricted habitat is defined as all other mixed conifer, pine-oak (except those pine-oak stands in the Southern Rocky Mountain Recovery Units and the Colorado Plateau Recovery Unit outside of New Mexico), and riparian forests not falling within PACs or slopes greater than 40 percent (Service 1995a). The 2012 Mexican Spotted Owl Recovery Plan, First Revision (Service 2012a) describes unoccupied protected habitat and all restricted habitat as "Recovery Habitat," no longer using the term restricted to describe foraging, dispersal, and future nest/roost habitat. The 2012 Recovery Plan also removes administratively reserved lands and steep slopes from automatic inclusion as protected areas.

The PCEs for Mexican spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the 1995 Recovery Plan (Service 1995a). Since owl habitat can include both canyon and forested areas (Service 2004; 2012a), PCEs were identified in both areas. The PCEs identified for the owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the owl's habitat needs for nesting, roosting, foraging, and dispersing are:

PCE I: A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with diameter at breast height (dbh) (1.4 meters (m) or 4.5 feet (ft) above ground) of 30.5 centimeters (cm) (12 inches (in)) or more;

PCE II: A shade canopy created by the tree branches covering 40 percent or more of the ground;

PCE III: Large, dead trees (snags) with a dbh of at least 30.5 cm (12 in).

PCE IV: High volumes of fallen trees and other woody debris;

PCE V: A wide range of tree and plant species, including hardwoods; and,

PCE VI: Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

The PCEs listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest-type productivity, and plant succession. These PCEs may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Steep-walled rocky canyonlands occur typically within the Colorado Plateau EMU, but also occur in other EMUs. Canyon habitat is used by owls for nesting, roosting, and foraging, and includes landscapes dominated by vertical-walled rocky cliffs within complex watersheds, including many tributary side canyons. These areas typically include parallel-walled canyons up to two kilometers (1.2 miles) in width (from rim to rim), with canyon reaches often two kilometers (1.2 miles) or greater, and with cool north-facing aspects. The PCEs related to canyon habitat include one or more of the following:

PCE I: Presence of water (often providing cooler and often higher humidity than the surrounding areas);

PCE II: Clumps or stringers of mixed-conifer, pine-oak, piñon-juniper, and/or riparian vegetation;

PCE III: Canyon walls containing crevices, ledges, or caves; and,

PCE IV: High percent of ground litter and woody debris.

Southwestern Willow Flycatcher (Flycatcher)

The flycatcher was listed as an endangered species in 1995 (Service 1995b). Critical habitat was first designated in 1997, and was recently re-designated in 2013 (Service 1997, Service 2013a).

Description and Life History

A detailed account of the taxonomy, biology, and reproductive characteristics of the Southwestern willow flycatcher is found in the Final Rule listing the flycatcher as endangered (Service 1995b) and the original Recovery Plan (Service 2002). The information provided in those documents is included herein by reference.

The flycatcher is a small, insect-eating generalist, neotropical migrant bird (Service 2002). It grows to about 15 centimeters (cm) [5.8 inches (in)] in length. It eats a wide range of invertebrate prey including flying, and ground- and vegetation-dwelling, insects of terrestrial and aquatic origins (Drost et al. 2003). It breeds in the southwestern U.S. and winters in Mexico, Central America, and extreme northern South America. Flycatchers arrive on breeding grounds in Arizona and New Mexico in late April and early May. Nesting begins in May and early June. Average clutch size is three to four eggs. The time from egg laying to fledging is short (28 days), and parental care of fledglings can last 15 days, and possibly much longer. For more detailed information on the flycatcher's biology, status of the species and critical habitat, see the Recovery Plan (Service 2002), designation of critical habitat (Service 2013a), and 5-year review (Service 2014a).

Habitat Requirements and Distribution

Flycatchers use riparian habitats that are generally dense, shrubby, moist, and that have abundant flying insects (Service 2002). Riparian habitat is used throughout the flycatcher's range for breeding and stop-over habitat during their long-distance migration. Nesting habitat can often be distinguished by plant species composition and habitat structure. Common tree and shrub species used for nesting include willows (*Salix spp*), buttonbush (*Cephalanthus spp*), box elder (*Acer negundo*), tamarisk (*Tamarix pentandra*), Russian olive (*Elaeagnus angustifolius*), and sometimes with a scattered overstory of cottonwood (*Populus spp*). Nest sites typically have a dense understory and canopy, dense vegetated patch interior, or an aggregate of dense patches interspersed with openings. Breeding habitat is largely associated with perennial (persistent) streamflow that can support the expanse of vegetation characteristics needed by breeding flycatchers. The hydrologic regime and supply of surface and subsurface water is a driving factor in the long-term maintenance, growth, recycling, and regeneration of flycatcher habitat (Service 2002).

The flycatcher Recovery Plan (Service 2002) divides the range of the flycatcher into six Recovery Units (RUs) and within them, smaller Management Units (MUs). These RUs represent large watershed and hydrologic units, and MUs represent smaller watersheds. For each MU, and for the RU as a whole, the measure of abundance used is the breeding territory (U.S. Fish and Wildlife Service 2002).

Within the USFS Southwest Region, the flycatcher is currently found nesting on four National Forests (NFs): the Apache-Sitgreaves and Tonto in Arizona, and the Carson and Gila in New Mexico; however, it is likely that flycatchers use major river drainages on many NFS lands during spring and fall migration. On the Tonto NF, flycatchers nest at Roosevelt Lake at the confluence of the Upper Salt River, on Tonto Creek, and on the Verde River at, below, and above Horseshoe Lake. On the Apache-Sitgreaves NF, flycatchers nest at two sites near Greer, Arizona (Little Colorado River), and at one site near Alpine, Arizona (San Francisco River headwaters). Flycatchers have likely used areas of the Prescott NF, nesting directly adjacent to an isolated piece of NFS land in Camp Verde. On the Carson NF, flycatchers nest at Rio Grande del Rancho. Migrant flycatcher habitat is not well understood, but has been recorded on major southwestern river drainages. Migrant birds have been detected in riparian habitat suitable and unsuitable for nesting and may occur in non-riparian areas. Such migration stopover areas may be critically important resources affecting productivity and survival (Service 2002).

Threats

Reasons for the decline and lack of recovery for the flycatcher are numerous, complex, interrelated, and are predominantly due to loss and modification of riparian habitat. The loss and modification of riparian habitat occurs due to dams and reservoirs, which alters natural stream flow patterns; groundwater pumping and surface water diversion, which may lower water tables and reduce riparian potential; stream channelization and bank stabilization, which separate the stream from its floodplain; removal of riparian vegetation; improper livestock grazing; recreation; fire; and cultural and urban development. Recovery of the flycatcher requires a watershed approach, and consideration of all interrelated factors that influence riparian habitat condition (Service 2002).

The changes in abundance of other species, especially exotic plants species and brown-headed cowbirds are a concern (Service 2002). Tamarisk (an exotic plant species) provides significant amounts of suitable flycatcher nesting habitat that has resulted in some of the densest and most successful nesting populations in the sub-species range (Service 2002). However, there are concerns about the overall recovery value of tamarisk, because, unlike native plants, it can facilitate periodic fire regimes detrimental to adjacent native riparian plants and bird communities (Service 2002).

Brood parasitism by brown-headed cowbirds can reduce flycatcher reproductive performance; this can be especially significant in small populations that are geographically distant from other source populations (Service 2002).

Because of their small population size, and the degree of fragmentation between breeding populations, flycatchers are susceptible to demographic stochasticity and reduced genetic variation. While not specifically a threat, but rather a consequence of the poor status of the species, these factors may influence the potential to down-list or recover the species (Service 2002). Recently, drought conditions have further reduced water levels, increased the potential for fire to occur in suitable habitat, and have exacerbated existing stressors created from water management, groundwater pumping, surface water diversion, livestock grazing, watershed degradation, etc.

Summary

Since listing, thousands of presence/absences surveys have been conducted throughout the historical range of the flycatcher. As of 2007, the population was estimated at approximately 1,300 territories distributed among approximately 280 breeding sites (Durst et al. 2008).

Southwestern Willow Flycatcher Designated Critical Habitat

Critical habitat was first designated in 1997, but was recently redesignated in 2013 (Service 1997, 2013a). San Ildefonso, Santa Clara, and Ohkay Owingeh Pueblo lands are excluded from designated critical habitat (Service 2013a). Range wide there are 84,568 hectares (208,973 acres) of designated critical habitat.

The PCEs of flycatcher critical habitat are those elements of the physical or biological features in an area that provide for life-history processes and are essential to the conservation of the flycatcher. The PCEs listed in the critical habitat for the flycatcher are:

PCE I: Riparian vegetation. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer's willow (*Salix geyeriana*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), pacific willow (*Salix lucida*), boxelder (*Acer negundo*), tamarisk (*Tamarix* spp.), Russian olive (*Eleagnus angustifolia*), buttonbush (*Cephalanthus* spp.), cottonwood (*Populus* spp.), stinging nettle (*Urtica dioica*), alder (*Alnus* spp.), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus* spp.), seep willow (*Baccharis salicifolia*), oak (*Quercus* spp.), rose (*Rosa* spp.), sycamore (*Platanus* spp.), false indigo (*Baptisia australis*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans* spp.)) and some combination of:

- **PCE I (a):** Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets [2 to 4 m (6 to 13 ft) tall] are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests;
- **PCE I (b):** Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
- **PCE I (c):** Sites for nesting that contain a dense (about 50–100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
- **PCE I (d):** Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 acres) or as large as 70 ha (175 acres).

PCE II: Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

Narrow-headed Gartersnake (Gartersnake)

The gartersnake was listed as a threatened species on July 8, 2014 (Service 2014b) and the proposed critical habitat rule published on July 10, 2013 (Service 2013b).

Description and Life History

A summary of the species and its habitat can be found in the final listing rule published on July 8, 2014 (Service 2014b), the proposed critical habitat rule published on July 10, 2013 (Service 2013b), and the associated Appendix A of the final listing rule, “Current Population Status of Northern Mexican and Narrow-headed Gartersnakes in the United States” (Service 2014b). These documents are hereby incorporated by reference.

The narrow-headed gartersnake is a colubrid, live-bearing (viviparous) species, with a maximum total length of 44 in (112 cm) (Painter and Hibbitts 1996). Its eyes are set high on its unusually elongated head, which narrows to the snout and it lacks striping on the dorsum (top) and sides, which distinguishes its appearance from other gartersnake species with which it could co-occur (Rosen and Schwalbe 1988). The base color is usually tan or grey-brown (but may darken) with conspicuous brown, black, or reddish spots that become indistinct towards the tail (Rosen and Schwalbe 1988; Boundy 1994). The scales are keeled. Degenhardt *et al.* (1996), Rossman *et al.* (1996), and Ernst and Ernst (2003) further describe the species.

The species is generally active from March to November. Female narrow-headed gartersnakes breed annually and give birth to 4 to 17 offspring from March to late July and into early August. Sexual maturity occurs at two years of age in males and at two to three years of age in females. Mating is presumed to occur during the spring months followed by the live birth of between four and seventeen newborns from late July into early August.

Narrow-headed gartersnakes eat fish primarily (Rosen and Schwalbe 1988; Degenhardt *et al.* 1996; Rossman *et al.* 1996; Nowak and Santana-Bendix 2002; Nowak 2006), likely exclusively, and are considered specialists in this regard. This species is an underwater ambush hunter that is believed to be heavily dependent on visual cues when foraging (de Queiroz 2003; Hibbitts and Fitzgerald 2005). Therefore, sediment and turbidity levels within the water column may affect foraging success. Native fish species considered as prey for the narrow-headed gartersnake include Sonora sucker (*Catostomus insignis*), desert sucker (*C. clarki*), speckled dace (*Rhinichthys osculus*), roundtail chub (*Gila robusta*), Gila chub (*Gila intermedia*), and headwater chub (*Gila nigra*) (Rosen and Schwalbe 1988; Degenhardt *et al.* 1996). Nonnative predatory fish species in their fingerling size classes are also used as prey by narrow-headed gartersnakes, including brown trout (*Salmo trutta*) (Rosen and Schwalbe 1988; Nowak and Santana-Bendix 2002; Nowak 2006), green sunfish (*Lepomis cyanellus*) (Fleharty 1967), smallmouth bass (*Micropterus dolomieu*) (M. Lopez, 2010, pers. comm.), and rock bass (*Ambloplites rupestris*) (Wilcox 2015). Reports suggest that brown trout are consumed more frequently than smallmouth bass. Nonnative fish with spiny dorsal fins are not generally considered suitable prey items due to the risk of injury to the gartersnake during ingestion and because of where they tend to occur in the water column (Nowak and Santana-Bendix 2002).

Native predators of the narrow-headed gartersnake include birds of prey, such as black-hawks (Etzel *et al.* 2014), other snakes such as regal ring-necked snakes (Brennan *et al.* 2009), wading birds, mergansers, belted kingfishers, raccoons (Rosen and Schwalbe 1988), and possibly other generalist mammalian predators. Historically, large, highly predatory native fish species such as

Colorado pikeminnow may have preyed upon narrow-headed gartersnakes where the species co-occurred. Native chubs (*Gila* spp.) in their adult size class may also prey on neonatal gartersnakes.

Habitat Requirements and Distribution

The narrow-headed gartersnake is widely considered to be one of the most aquatic of the gartersnakes (Drummond and Marcias Garcia 1983; Rossman *et al.* 1996). This species is strongly associated with clear, rocky streams, using predominantly pool and riffle habitat that includes cobbles and boulders (Rosen and Schwalbe 1988; Degenhardt *et al.* 1996; Rossman *et al.* 1996; Nowak and Santana-Bendix 2002; Ernst and Ernst 2003). Narrow-headed gartersnakes have also been observed using reservoir shoreline habitat in New Mexico (Flehart 1967; Rossman *et al.* 1996, Hellekson 2012, pers. comm.). Narrow-headed gartersnakes occur at elevations from approximately 2,300 to 8,000 feet (701 to 2,430 meters), inhabiting Petran Montane Conifer Forest, Great Basin Conifer Woodland, Interior Chaparral, and Arizona Upland Sonoran Desertscrub communities (Rosen and Schwalbe 1988; Brennan and Holycross 2006). Despite the reputation of being highly aquatic, narrow-headed gartersnakes found in water represented less than 10 percent of total observations according to a multi-year telemetry study in New Mexico, with slightly more females found in water compared to males (Jennings and Christman 2012). These data suggest that this species may spend a relatively small percentage of its time in the water, but compared to other native gartersnakes, it is still the most aquatic. Narrow-headed gartersnakes also use terrestrial, upland habitat during periods of cold-season dormancy, for gestation of young in pregnant females, for basking to aid digestion and for healing from injury or illness, and to escape flood events. Nowak (2006) reported narrow-headed gartersnakes using upland habitat 328 feet (100 meters) away from the stream during early fall and spring months. During cold-season dormancy periods, narrow-headed gartersnakes may use upland habitat up to 656 feet (200 meters) or farther out of the floodplain (Nowak 2006).

The historical distribution of the narrow-headed gartersnake ranged across the Mogollon Rim and along associated perennial stream drainages from central and eastern Arizona, southeast to southwestern New Mexico at elevations ranging from 2,300 to 8,000 feet (700 to 2,430 meters) (Rosen and Schwalbe 1988; Rossman *et al.* 1996; Holycross *et al.* 2006). The species was historically distributed in headwater streams of the Gila River subbasin that drain the Mogollon Rim and White Mountains in Arizona, and the Gila Wilderness in New Mexico. Major subbasins in its historical distribution included the Salt and Verde River subbasins in Arizona, and the San Francisco and Gila River subbasins in New Mexico (Holycross *et al.* 2006).

Threats

Threats to the species include predation by non-native aquatic species (*Centrarchids*, *Ictalurids*, brown trout); bullfrogs and crayfish; reduction or removal of prey base; ash flows from wildfire that remove the prey base or habitat for prey species; natural or anthropogenic dewatering of aquatic habitat; indirect effects from fisheries management activities; road construction, use, and maintenance; adverse interactions with humans; and livestock grazing in the presence of harmful nonnative species.

Summary

Information regarding the status of the species has not changed significantly since the final listing of the species; however, some populations have been affected by wildfire to varying degrees. In 2012, narrow-headed gartersnake populations in Whitewater Creek and the Middle Fork Gila River were affected by New Mexico's largest wildfire in state history, the Whitewater-Baldy Complex Fire. Furthermore, the 2014 Slide Fire in Arizona affected the population of gartersnakes in Oak Creek and West Fork Oak Creek. These wildfires and subsequent post-fire flooding caused ash and sediment flows and deposition, which resulted in fish kills and loss of aquatic foraging habitat and prey. It appears that impacts to gartersnake populations can vary with the degree of impacts to fish prey species. Post-wildfire impacts to these populations of narrow-headed gartersnakes are still under evaluation.

Narrow-headed Gartersnake Proposed Critical Habitat

There are 6 units proposed as critical habitat for the narrow-headed gartersnake, which includes approximately 210,189 acres (Service 2013b). All proposed critical habitat units are considered occupied. Critical habitat units occur in Greenlee, Graham, Apache, Yavapai, Navajo, Gila, and Coconino Counties in Arizona, as well as in Grant, Hidalgo, Sierra, and Catron Counties in New Mexico.

Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of the narrow-headed gartersnake consist of the following components:

PCE I: Stream habitat, which includes:

- **PCE I (a):** Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
- **PCE I (b):** A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
- **PCE I (c):** Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub- and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and
- **PCE I (d):** Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

PCE II: Adequate terrestrial space (600 ft., 182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

Loach Minnow

The loach minnow was listed as threatened on October 28, 1986 (Service 1986). Critical habitat was designated on April 25, 2000, and re-designated on March 21, 2007 (Service 2000, Service 2007). The Service then re-evaluated the status of the loach minnow and reclassified the species as endangered on February 23, 2012, along with designated critical habitat (Service 2012c).

Description and Life History

A detailed account of the taxonomy, biology, and reproductive characteristics of the loach minnow is found in the Final Rule listing the loach minnow as endangered (Service 2012c) and the original Recovery Plan (Service 1991). The information provided in those documents is included herein by reference.

The loach minnow is a small, slender, elongate fish rarely exceeding 60 mm (2.4 in) long, with eyes that are directed upward and a terminal mouth that has no barbels (Minckley 1973). Loach minnow have an olivaceous coloration that is highly blotched with darker pigment; whitish spots are present at the origin and insertion of the dorsal fin as well as the dorsal and ventral portions of the caudal fin base. Breeding males develop bright red-orange coloration at the bases of the paired fins, on adjacent fins, on the base of the caudal opening, and often on the abdomen. Breeding females become yellowish in color on their fins and lower body (Minckley 1973; Sublette et al. 1990).

The first spawn of loach minnow generally occurs in their second year, primarily from March through May (Propst et al. 1988). Spawning occurs in the same riffles occupied by adults during the non-spawning season (Propst 1999). The adhesive eggs of the loach minnow are attached under the downstream side of a rock that forms the roof of a small cavity in the substrate (Propst 1999). The number of eggs per rock ranges from 5 to more than 250, but is usually between 52 and 63 (Propst et al. 1988). Limited data indicate that the male loach minnow may guard the nest during incubation (Propst et al. 1988).

Habitat Requirements and Distribution

The loach minnow is found in turbulent, rocky riffles of rivers and tributaries from 709 m (2,325 ft.) up to about 2,513 m (8,240 ft.) in elevation. Loach minnow are bottom-dwelling inhabitants of shallow, swift waters flowing over gravel, cobble, and rubble substrates in mainstream rivers and tributaries. They use the spaces between, and in the lee of larger substrates for resting and spawning (Propst 1999). The species is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). They are opportunistic benthic insectivores, feeding primarily on riffle-dwelling larval mayflies (Ephemeroptera), blackflies (Simuliidae), and midges (Chironomidae) (Propst 1999). They actively seek their food on bottom substrates, rather than pursuing food items in the drift (Arizona Game and Fish Department 2002).

The loach minnow is endemic to the Gila River basin of Arizona and New Mexico, and Sonora, Mexico. Its historic range included the basins of the Verde, Salt, San Pedro, San Francisco, and

Gila rivers (Minckley 1973, Sublette et al. 1990). The species is believed to be extirpated from Mexico. During the last century, both the distribution and abundance of the loach minnow have been greatly reduced throughout its range (Propst et al. 1988). Extant populations are geographically isolated and inhabit the upstream reaches of their historic range.

Threats

During the last century, both the distribution and abundance of the loach minnow have been greatly reduced throughout the species' range (Propst et al. 1988). Competition and predation by non-native fish and habitat destruction have reduced the historic range of the loach minnow by about 85% (Service 1986). Both historic and present landscapes surrounding loach minnow habitats have been impacted to varying degrees by domestic livestock grazing, mining, agriculture, timber harvest, recreation, development, or impoundments. These activities degrade loach minnow habitats by altering flow regimes, increasing watershed and channel erosion and thus sedimentation, and adding contaminants to streams and rivers (Belsky et al. 1999). As a result, these activities may affect loach minnow through direct mortality, interference with reproduction, and reduction of invertebrate food supplies.

Competition with non-native fishes is often cited as a major factor in the decline of loach minnow (Propst 1999). The red shiner, in particular, is frequently indicated in the decline of this fish (Minckley 1973). The red shiner out-competes loach minnow for food items and habitat, and is very tolerant of many extremes found in the desert and semi-desert aquatic habitats. Channel catfish (*Ictalurus punctatus*) and flathead catfish (*Pylodictis olivaris*) frequent riffles occupied by loach minnow, especially at night when catfish move onto riffles to feed (Propst 1999) and may prey on loach minnow. In addition, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), and introduced trout (Salmonidae) may co-occur and prey on loach minnow. These non-native fish may also impact loach minnow populations through competition for food and space.

Summary

Past changes in the range and population density of loach minnow undoubtedly occurred in response to natural spatial and temporal variations in the environment, but its current status is the result of human activities (Service 2010). Much of the Upper Gila River Basin is in a degraded condition with poor riparian habitats, incised channels, poor bank stability, and high streambed embeddedness due to water diversion and pumping, livestock grazing, and road construction (Service 2010).

Loach Minnow Designated Critical Habitat

Critical habitat for the loach minnow and spikedace was designated concurrently in 2007 and most recently in 2012 (Service 2007a, Service 2012c). This designation included 5 complexes along the Verde River, Black River, Middle Gila/Lower San Pedro/Aravaipa Creek, San Francisco and Blue Rivers, and Upper Gila River, comprising 522.2 miles. The primary constituent elements for this critical habitat designation include:

PCE I: Permanent, flowing water with no or minimal pollutant levels, including:

- **PCE I (a):** Living areas for adult loach minnow with moderate to swift flow velocities between 9.0 to 32.0 in/second in shallow water between approximately 1.0 to 3.0 inches in depth, with gravel, cobble, and rubble substrates;
- **PCE I (b):** Living areas for juvenile loach minnow with moderate to swift flow velocities between 1.0 and 34.0 in/second in shallow water approximately 1.0 to 30 inches in depth with sand, gravel, cobble, and rubble substrates;
- **PCE I (c):** Living areas for larval loach minnow with slow to moderate velocities between 3.0 and 20.0 in/second in shallow water with sand, gravel, and cobble substrates;
- **PCE I (d):** Spawning areas with slow to swift flow velocities in shallow water where cobble and rubble and the spaces between them are not filled in by fine dirt or sand;
- **PCE I (e):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Spikedace

The spikedace was listed as threatened on July 1, 1986 (Service 1986). Critical habitat was designated on April 25, 2000, and re-designated on March 21, 2007 (Service 2000, Service 2007). The Service then re-evaluated the status of the spikedace and reclassified the species as endangered on February 23, 2012, along with designated critical habitat (Service 2012c).

Description and Life History

A detailed account of the taxonomy, biology, and reproductive characteristics of the loach minnow is found in the Final Rule listing the spikedace as endangered (Service 2012c) and the original Recovery Plan (Service 1991). The information provided in those documents is included herein by reference.

Adult spikédace are 63-75 mm (2.5-3.0 in) long (Sublette et al. 1990). The eyes are large, the snout fairly pointed, and the mouth is slightly sub-terminal with no barbells present. The species is slender and somewhat compressed anteriorly. Scales are present only as small deeply embedded plates. The first spinous ray of the dorsal fin is the strongest and most sharp-pointed.

Spikédace are olive-gray to light brown above with brilliant silver sides and black specks and blotches on the back and upper side. Breeding males have bright brassy yellow heads and fin bases, with yellow bellies and fins (Minckley 1973). Spikédace can live up to 24 months, although few survive more than 13 months (Propst et al. 1986). Reproduction occurs primarily in one-year-old fish (Propst et al. 1986).

Spawning extends from mid-March into June and occurs in shallow (less than 15 cm [5.9 in] deep) riffles with gravel and sand bottoms and moderate flow. By mid-May, most spawning has occurred, although in years of high water flows, spawning may continue into late May or early June (Propst et al. 1986). Reproduction is apparently initiated in response to a combination of declining stream discharge and increasing water temperature. The ova are adhesive and demersal and adhere to the substrate (Barber et al. 1983). The number of eggs produced varies from 100 to over 800, depending on the size of the individual (Minckley 1973, Propst et al. 1986). The young grow rapidly, attaining a length of 38 mm (1.5 in) by autumn of the year spawned (Propst 1999).

Spikédace feed primarily on aquatic and terrestrial insects. In addition, Barber et al. (1983) reported that spikédace feed on food items in the drift including some fish fry. Diet composition is largely determined by type of habitat and time of year (Minckley 1973).

Habitat Requirements and Distribution

Spikédace occupy mid-water habitats usually less than 1 m deep, with slow to moderate water velocities over sand, gravel, or cobble substrates. Adults often aggregate in shear zones along gravel-sand bars where rapid water borders slower flow, quiet eddies on the downstream edges of riffles, and broad shallow areas above gravel-sand bars (Propst et al. 1986). The preferred habitat of the spikédace varies seasonally and with maturation (Propst et al. 1986). In winter, the species congregates along stream margins with cobble substrates. The erratic flow patterns of southwestern streams that include periodic spates and recurrent flooding are essential to the feeding and reproduction of the spikédace by scouring the sands and keeping gravels clean (Propst et al. 1986). Spikédace larvae and juveniles tend to occupy shallow, peripheral portions of streams that have slow currents and sand or fine gravel substrates, but will also occupy backwater habitats (Sublette and others 1990). The young typically occupy stream margin habitats, where the water velocity is less than 8 cm/sec (0.26 ft. /sec) and the depth is less than 30 cm (0.98 ft.).

The spikédace is native to the Gila River drainage, including the San Francisco drainage, except in the extreme headwaters (Propst et al. 1986). The spikédace currently persists only in the upper Verde River and Aravaipa Creek in Arizona and portions of the Gila River in New Mexico.

Threats

Distribution and abundance of spokedace has declined due to riparian degradation, water diversion, and groundwater pumping. Introduction and spread of non-native predatory and competitive fishes also contributed to its decline. Resource activities that affect water quality, such as removal of riparian vegetation, sedimentation, or control of water levels, can affect spokedace habitat quality and should be avoided or corrected.

Habitat destruction, and competition and predation from introduced non-native fish are the primary causes of the species' decline (Miller 1961). Competition with non-native fishes is often cited as a major factor in the decline of spokedace (Propst 1999). The red shiner, in particular, is frequently indicated in the decline of this fish (Minckley 1973). The red shiner is a very competitive species that out-competes spokedace for food items and habitat and is very tolerant of many extremes found in the desert and semi-desert aquatic habitats. Non-native fish such as channel catfish and flathead catfish frequent riffles occupied by spokedace, especially at night when catfish move onto riffles to feed (Propst 1999) and may prey on spokedace. In addition, largemouth bass, smallmouth bass, green sunfish, and introduced trout may co-occur and prey on spokedace. These non-native fish may also impact spokedace populations through competition for food and space.

Summary

Since the 1800s, the spokedace has declined markedly in distribution and abundance throughout its range (Propst et al. 1986, Service 1986). By 1996, the spokedace had been eliminated from over 85% of its historic range (New Mexico Department of Game and Fish 1996). Recent taxonomic and genetic work on spokedace, indicate there are substantial differences in morphology and genetic composition among remnant spokedace populations. In New Mexico spokedace occur in the West and Middle forks of the Gila River and the Gila River Mainstem, and in the San Francisco River near the town of Glenwood.

Spokedace Designated Critical Habitat

Critical habitat for the loach minnow and spokedace was designated concurrently in 2007 and most recently in 2012 (Service 2007a, Service 2012c). This designation included 5 complexes along the Verde River, Black River, Middle Gila/Lower San Pedro/Aravaipa Creek, San Francisco and Blue Rivers, and Upper Gila River, comprising 522.2 miles. The primary constituent elements for this critical habitat designation include:

PCE I: Permanent, flowing water with no or minimal pollutant levels, including;

- **PCE I (a):** Living areas for adult spokedace with slow to swift flow velocities between 8.0 and 24.0 in/second in shallow water between 4.0 in and 40.0 in in depth, with shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges;

- **PCE I (b):** Living areas for juvenile spinedace with slow to moderate water velocities approximately 8.0 in/second or higher in shallow water between approximately 1.2 in and 40 in in depth;
- **PCE I (c):** Living areas for larval spinedace with slow to moderate flow velocities of approximately 4.0 in/second or higher in shallow water approximately 1.2 in and 40.0 in in depth; and
- **PCE I (d):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

ENVIRONMENTAL BASELINE

Under Section 7(a)(2) of the ESA, when considering the effects of the action on federally listed species, we are required to take into consideration the environmental baseline. Regulations implementing the ESA define the environmental baseline (50 CFR 402.02) as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in progress. The environmental baseline defines the status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Status of the Species and Critical Habitat within the Action Area

Mexican Spotted Owl

The Gila National Forest is located within the Upper Gila Mountains Recovery Unit (UGM-7) which spans across portions of New Mexico and Arizona (Service 2012a). The UGM-7 Recovery Unit contains the largest known population of MSO, with approximately 63% of the known MSO Protected Activity Centers (PACs) in the Forest Service Southwest Region (i.e., New Mexico and Arizona). There are a total of 26 PACs within the action area, comprising approximately 16,717 acres. The action area contains approximately 3% of the MSO PACs, 3%

of PAC acres, and 4% of total MSO habitat within the UGM-7 Recovery Unit. In addition, these 26 PACs make up approximately 8% of the total number of PACs on the Gila National Forest.

MSO PACs in the Action Area have been monitored randomly since the PACs were established, with 22 of the PACs having been monitored at least once in the past two years (i.e., 2016 and 2017). The remaining 4 PACs will be monitored prior to project implementation in those areas. Of the 22 PACs which have been monitored, 12 have been confirmed as occupied in the last two years. While the other 10 PACs have negative monitoring results, this does not preclude those PACs being occupied in the future; therefore, monitoring for the 10 PACs would need to be completed prior to project implementation (Table 5).

Table 5. Mexican Spotted Owl Protected Activity Center monitoring data within the Luna Restoration Project action area. Positive survey results are in bold print.

MSO PAC	Survey Results 2016	Survey Results 2017
Bill Knight	Not Monitored	Not Monitored
Bishop Canyon	Positive Pair	Not Monitored
Bishop Peak	Not Monitored	Not Monitored
Cap Mamie 1	Not Monitored	Not Monitored
Cap Mamie 2	Positive Pair	Not Monitored
Cap Mamie 3	Positive Single	Not Monitored
Divide	Negative	Positive Pair
Frieborn	Negative	Positive Pair
Horse Mesa	Negative	Not Monitored
H-V 1	Positive Single	Not Monitored
Laney Spring	Negative	Not Monitored
Lily 1	Negative	Not Monitored
Lily 2	Negative	Not Monitored
Lily 3	Negative	Not Monitored

Table 5. Mexican Spotted Owl Protected Activity Center monitoring data within the Luna Restoration Project action area. Positive survey results are in bold print.

MSO PAC	Survey Results 2016	Survey Results 2017
Lily 4	Positive Single	Not Monitored
Lily 5	Negative	Positive Single
Lower Left Hand Canyon	Positive Pair	Negative
Mail	Negative	Not Monitored
SA Creek	Negative	Negative
Sand Creek	Positive Single	Not Monitored
Swapp Booth 1	Negative	Negative
Swapp Booth 2	Positive Single	Positive Pair
Swapp Booth 3	Not Monitored	Not Monitored
Swapp Booth 4	Negative	Not Monitored
Turner Peak	Negative	Not Monitored
Upper Left Hand Canyon	Positive Single	Negative

Mexican Spotted Owl Designated Critical Habitat

The action area contains 64,293 acres of designated MSO critical habitat. The UGM-7 Recovery Unit contains approximately 863,344 acres of critical habitat; thus, the action area comprises approximately 7% of the total Recovery Unit. In addition to critical habitat in the action area, there are approximately 32,042 acres of recovery habitat with 6,984 acres that are managed for nest/roost replacement and 25,058 acres that are managed as foraging/non-breeding habitat. The following describes the status of PCEs within the action area:

PCE I: A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with dbh (1.4 m or 4.5 feet above ground) of 30.5 cm (12 in) or more.

Status of PCE I in Action Area: Based on vegetation modeling described in the BA, approximately 42% of canopy cover is from Ponderosa pine and approximately 46% is from

mixed conifer. Within the Ponderosa pine, approximately 55% of total trees are above 12 in. dbh, with approximately 34% in the 12-18 in. age class and 21% in the above 18 in. age class. Within the mixed conifer, approximately 55% of total trees are above 12 in. dbh, with approximately 29% in the 12-18 in. age class and 26% in the above 18 in. age class. The 2012 MSO Recovery Plan recommends that both of these age classes comprise 30% each of the total trees within these forest types. Therefore, this PCE is present within the action area to a moderate extent with slight deficiencies in the above 18 in. age class for the Ponderosa pine forest type and in both age classes above 12 in. for the mixed conifer forest type.

PCE II: A shade canopy created by the tree branches covering 40 percent or more of the ground.

Status of PCE II in Action Area: Based on vegetation modeling described in the BA, there is sufficient canopy cover within the action area with approximately 42% Ponderosa pine and 46% mixed conifer. The 2012 MSO Recovery Plan recommends minimum canopy cover of 40% in Ponderosa pine and 60% in mixed conifer. Therefore, this PCE is present within the action area to a moderate extent, with slight deficiencies in canopy cover within mixed conifer habitat.

PCE III: Large, dead trees (snags) with a dbh of at least 30.5 cm (12 in).

Status of PCE III in Action Area: Based on vegetation modeling described in the BA, there are approximately 7 Ponderosa pine snags per acre and 8 mixed conifer snags per acre which meet this definition. Therefore, this PCE is present within the action area to a moderate extent.

PCE IV: High volumes of fallen trees and other woody debris.

Status of PCE IV in the Action Area: Based on information presented in the BA, the action area contains high volumes of fallen trees and other debris. Therefore, this PCE is present to a high extent.

PCE V: A wide range of tree and plant species, including hardwoods.

Status of PCE V in the Action Area: Based on information presented in the BA, the action area contains high species richness, including hardwoods. Therefore, this PCE is present to a high extent.

PCE VI: Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

Status of PCE VI in the Action Area: Based on information presented in the BA, the action area contains adequate levels of plant cover to maintain fruits and seeds and allow for plant regeneration. Therefore, this PCE is present to a high extent.

Flycatcher

The action area is located within the Gila Recovery Unit, which contains the Upper Gila Management Unit and the San Francisco Management Unit (Service 2002). Based on 2007

breeding site and territory surveys, the Upper Gila Management Unit had 329 territories and the San Francisco Management Unit had 7 territories. Although the action area is located within the Gila Recovery Unit, there were no flycatchers detected within the action area during the 2007 surveys and there are no historical records of the species occurring in the project area.

Flycatcher Designated Critical Habitat

The San Francisco Management Unit and Upper Gila Management Unit within the Gila Recovery Unit contain a total of 21,235 acres. There are 533 acres of flycatcher critical habitat located in the action area along the San Francisco River (approximately 3% of the total management unit acreage). The following describes the status of the PCEs within the action area:

PCE I: Riparian vegetation. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer's willow (*Salix geyeriana*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), pacific willow (*Salix lucida*), boxelder (*Acer negundo*), tamarisk (*Tamarix* spp.), Russian olive (*Eleagnus angustifolia*), buttonbush (*Cephalanthus* spp.), cottonwood (*Populus* spp.), stinging nettle (*Urtica dioica*), alder (*Alnus* spp.), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus* spp.), seep willow (*Baccharis salicifolia*), oak (*Quercus* spp.), rose (*Rosa* spp.), sycamore (*Platanus* spp.), false indigo (*Baptisia australis*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans* spp.)) and some combination of:

- **PCE I (a):** Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets [2 to 4 m (6 to 13 ft) tall] are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests;
- **PCE I (b):** Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
- **PCE I (c):** Sites for nesting that contain a dense (about 50–100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
- **PCE I (d):** Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 acres) or as large as 70 ha (175 acres).

Status of PCE I in the Action Area: Based on information provided in the BA, the majority of the riparian habitat in the action area does not provide the PCEs required by the species. Details are provided below.

- **Status of PCE I (a) in the Action Area:** Based on information presented in the BA, critical habitat within the action area consists mostly of herbaceous species with widely scattered willow shrubs and cottonwoods. Therefore, this PCE is present to a low extent within the action area.
- **Status of PCE I (b) in the Action Area:** Based on information presented in the BA, critical habitat within the action area consists mostly of herbaceous species with widely scattered willow shrubs and cottonwoods. Therefore, this PCE is present to a low extent within the action area.
- **Status of PCE I (c) in the Action Area:** Based on information presented in the BA, critical habitat within the action area consists of tree canopies that are less than 50 percent. Therefore, this PCE is not present in the action area.
- **Status of PCE I (d) in the Action Area:** Based on information presented in the BA, critical habitat within the action area does not contain marsh openings. Therefore, this PCE is not present in the action area.

PCE II: Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

Status of PCE II in the Action Area: The BA does not present information on this PCE; however, it can be inferred from the lack of appropriate riparian vegetation that this PCE is most likely present to a low extent within the action area.

Narrow-headed Gartersnake

The action area contains possible habitat for the gartersnake on the Dry Blue Creek and the San Francisco River. According to our files, the first record for narrow-headed gartersnakes in Dry Blue Creek was in 2010. Hellekson (2012, pers. comm.) spent nearly 12 person-search hours in Dry Blue Creek in 2010 surveying for narrow-headed gartersnakes and observed one narrow-headed gartersnake. We consider the narrow-headed gartersnake to be extant in Dry Blue Creek, likely as a low density population.

There are records of occurrence downstream of the action area on the San Francisco River. Survey efforts from 2008–2011, consisting of approximately 100 person-search hours, confirmed the species as extant with documentation of three narrow-headed gartersnakes from the San Francisco River in New Mexico (Hellekson 2012, pers. comm.; Hellekson 2013, pers. comm.).

Gartersnake monitoring occurred at the Head of the Ditch campground on the San Francisco River in July 2016; however, no gartersnakes were caught or observed during the survey. While no recent occurrences have been determined, all possible habitat within the action area has not

been surveyed. Combined with the lack of exhaustive surveys and the low detection probability for the gartersnake, the Forest Service is assuming presence of gartersnakes within the Action Area.

Narrow-headed Gartersnake Proposed Critical Habitat

Gartersnake proposed critical habitat within the action area lies within the proposed San Francisco Sub-basin critical habitat unit, which includes approximately 45,075 acres distributed among 8 sub-units. The action area contains 2,781 acres of proposed critical habitat for the gartersnake along Dry Blue Creek and the San Francisco River. The total proposed critical habitat within the Dry Blue Creek and San Francisco River sub-units is approximately 24,498 acres; thus, the proposed critical habitat within the action area comprises approximately 11% of these two sub-units and approximately 6% of the entire proposed critical habitat unit. The following describes the PCEs within the action area:

PCE I: Stream habitat.

- **PCE I (a):** Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
- **PCE I (b):** A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
- **PCE I (c):** Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities;
- **PCE I (d):** Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

PCE II: Adequate terrestrial space (600 ft., 182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

Status of PCE I-II in the Action Area: The action area contains stream habitat and adequate terrestrial space along the later extent of both Dry Blue Creek and the San Francisco River. Therefore, this PCE is present to a moderate extent in the action area.

Loach Minnow

Within the action area, the loach minnow is considered extant within the San Francisco River and Dry Blue Creek based on positive survey results from prior to 2011 (AZGFD 2013). Based on information provided by the Forest, monitoring was completed at a monitoring site within designated critical habitat in the action area during 2006, 2007, 2008, 2010, and 2011. In 2006,

monitoring efforts detected 19 loach minnow; in 2007, monitoring detected 35 loach minnow; in 2008, monitoring detected 35 loach minnow; in 2010 and 2011, no loach minnow were detected. Monitoring in 2011 was conducted after the Wallow Fire, which resulted in significant scouring to the stream. There have been no survey efforts since 2011 specifically within the action area (Monzingo 2019, pers. comm).

Loach Minnow Designated Critical Habitat

Loach minnow critical habitat within the action area lies within the San Francisco and Blue River Complex, which includes approximately 235.0 stream miles (Service 2012c). There are approximately 5.6 miles of designated critical habitat within the action area, along Dry Blue Creek, Campbell Blue Creek, and Centerfire Creek-Blue River. Thus, the critical habitat within the action area comprises approximately 2% of the entire critical habitat unit, and approximately 1% of the entire critical habitat designation. The following describes the PCEs within the action area.

PCE I: Permanent, flowing water with no or minimal pollutant levels.

- **PCE I (a, b, c):** Living areas for loach minnow adults, juveniles, and larvae with appropriate flow regimes and substrates.
- **PCE I (d):** Spawning areas with slow to swift flow velocities in shallow water where cobble and rubble and the spaces between them are not filled in by fine dirt or sand.
- **PCE I (e):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Status of PCE I-V in the Action Area: The action area contains the appropriate stream habitat along Dry Blue Creek, Campbell Blue Creek, and Centerfire Creek-Blue River. Based on information provided by the Forest, approximately 2.25 miles of designated critical habitat is considered perennial with the remaining 3.36 miles considered as intermittent or ephemeral (Monzingo 2019, pers. comm). Therefore, this PCE is present to a moderate extent in the action area.

Spikedace

Spikedace is native to the Gila River drainage, including the San Francisco River drainage, except in the extreme headwaters (Propst et al. 1986). In New Mexico, spikedace occur in the West and Middle forks of the Gila River and the Gila River Mainstem, as well as in the San Francisco River near the town of Glenwood. Spikedace have not been located within the action area since approximately 2001 (AZGFD 2013).

Spikedace Designated Critical Habitat

Spikedace critical habitat within the action area lies within the San Francisco and Blue River Complex, which includes approximately 235.0 stream miles (Service 2012c). There are approximately 5.6 miles of designated critical habitat within the action area, along Dry Blue Creek, Campbell Blue Creek, and Centerfire Creek-Blue River. Thus, the critical habitat within the action area comprises approximately 2% of the entire critical habitat unit, and approximately 1% of the entire critical habitat designation. The following describes the PCEs within the action area:

PCE I: Permanent, flowing water with no or minimal pollutant levels.

- **PCE I (a, b, c):** Living areas for loach minnow adults, juveniles, and larvae with appropriate flow regimes and substrates.
- **PCE I (d):** Spawning areas with slow to swift flow velocities in shallow water where cobble and rubble and the spaces between them are not filled in by fine dirt or sand.
- **PCE I (e):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Status of PCE I-V in the Action Area: The action area contains the appropriate stream habitat along Dry Blue Creek, Campbell Blue Creek, and Centerfire Creek-Blue River. Based on information provided by the Forest, approximately 2.25 miles of designated critical habitat is considered perennial with the remaining 3.36 miles considered as intermittent or ephemeral (Monzingo 2019, pers.comm). Therefore, this PCE is present to a moderate extent in the action area.

Factors Affecting the Species and Critical Habitat within the Action Area

Mexican Spotted Owl and Designated Critical Habitat

The interrelated effects from severe wildland fire, historical and current fire management practices, historical silvicultural practices, grazing practices, recreational activities, and a changing climate have impacted the MSO through direct habitat loss, alteration of food and cover resources needed by prey species, and alteration or elimination of vegetation that may develop into roosting or nesting cover. The potential for future wildland fire exists within the action area. Based on vegetation and fire modeling included in the BA, all 26 PACs within the action area demonstrate some potential for high severity, active crown fire in the future.

Flycatcher Designated Critical Habitat

The interrelated effects from dam and reservoir creation, groundwater pumping and surface water diversion, stream channelization and bank stabilization, the removal of riparian vegetation, grazing practices, recreation, fire, and urban development have impacted the flycatcher through direct habitat loss and modification of habitat. The potential for future wildland fire exists within the action area, which could lead to alteration of riparian habitats necessary for the flycatcher.

Narrow-headed Gartersnake and Proposed Critical Habitat

The interrelated effects from wildland fire, natural or anthropogenic dewatering of aquatic habitat, road construction, use, and maintenance, grazing practices, and the presence of nonnative species have impacted the gartersnake through alteration of habitat and direct competition for resources. The potential for future wildland fire exists within the action area, which could lead to ash flows that remove the prey base or habitat for prey species.

Loach Minnow and Designated Critical Habitat

The interrelated effects of historical silvicultural practices, wildland fire, livestock grazing, recreation, and development have impacted the loach minnow through habitat alteration. In addition, the presence of nonnative species has resulted in impacts to loach minnow populations through competition for food and space. The potential for future wildland fire exists within the action area, which could result in indirect effects to stream habitats.

Spikedace Designated Critical Habitat

The interrelated effects of historical silvicultural practices, wildland fire, livestock grazing, recreation, and development have impacted the spikedace through habitat alteration. In addition, the presence of nonnative species has resulted in impacts to spikedace populations through competition for food and space. The potential for future wildland fire exists within the action area, which could result in indirect effects to stream habitats.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, which will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

This biological opinion relies on the revised regulatory definition of “destruction or adverse modification” of designated or proposed critical habitat from 50 CFR 402.02. As of February 11, 2016, the definition of “destruction or adverse modification” has been revised to align it with the conservation purposes of the Endangered Species Act of 1973, as amended, and the ESA’s definition of “critical habitat” (Service 2016). Specifically, the rule states: “Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.” The revised definition continues to focus on the role that critical habitat plays for the conservation of listed species and acknowledges that the development of physical and biological features may be necessary to enable the critical habitat to support the species recovery.

Mexican Spotted Owl

The proposed action will implement several direct restoration actions in Mexican spotted owl habitat. These actions will include: mechanical thinning and slash removal, prescribed burning, herbicide treatment, road decommissioning, fence construction, pipeline construction, drilling of wells and development of water systems, stream crossing improvements, and creation of stream sedimentation structures. Of the 26 PACs located within the action area, 22 have been monitored at least once in the past two years (2016, 2017), with 12 confirmed as occupied during at least one of those two years. Therefore, the proposed action has the potential for direct and indirect effects to the MSO, as described below. The effects analysis below utilized GIS files sent from the Forest Service to the Service, which included information related to the proposed action as well as species-specific data.

Direct Effects

The proposed action has the potential to disturb nesting owls via increased human activity and noise associated with chainsaws and other mechanized equipment used for mechanical thinning; however, the Forest is proposing to conduct these activities outside of the breeding season, or after non-breeding has been determined, in order to limit disturbance to nesting owls.

The proposed action has the potential to disturb owls from activities associated with haul trucks. While mechanical treatments are proposed to occur outside of the breeding season, it is possible that haul trucks may be active in areas within or adjacent to PACs during and outside of the breeding season. This activity creates the potential for vehicle collisions with trucks.

The proposed action also has the potential to disturb nesting owls via smoke from prescribed burning activities; however, the Forest is proposing to conduct these activities outside of the breeding season, or after non-breeding has been determined, in order to limit disturbance to nesting owls. Therefore, direct effects to the MSO from the proposed actions are anticipated to be minimal.

Indirect Effects

The proposed action will affect MSO habitat composition at multiple levels and thereby

indirectly effect the MSO via activities associated with mechanical thinning and slash treatment, prescribed burning, herbicide treatment, road decommissioning, fence construction, pipeline construction, drilling of wells and development of water systems, stream crossing improvements, and creation of stream sedimentation structures.

Mechanical Thinning, Hand Thinning, and Slash Treatment

There are a total of 26 PACs within the action area, comprising 16,717 acres. Mechanical thinning will occur via small diameter tree removal (<9 inches diameter at breast height (dbh)) and associated slash treatment on approximately 1,310 PAC acres (approximately 8%) in the action area. Specifically, this will impact 8 out of the 26 PACs (approximately 31%) within the action area (Bill Knight, Swapp Booth 2, Divide, Lower Left Hand Canyon, Upper Left Hand Canyon, Laney Spring, Lily 2, and Lily 3) (Figure 4; Table 6). According to GIS files, these mechanical treatments will also include slash treatment via removal (approximately 371 acres) or pile and burn (approximately 948 acres).

Outside of PACs, there are approximately 32,042 acres of recovery habitat with 6,984 acres that are managed for nest/roost replacement and 25,058 acres that are managed as foraging/non-breeding habitat. Within recovery habitat, a variety of mechanical treatments (e.g., group selection and thinning, improvement thinning, etc.) will occur. Approximately 18,205 acres of recovery habitat will receive some form of mechanical treatment (Table 7).

The goal of mechanical treatment is to maintain and restore woodland and grassland habitats. Treatments in woodland areas would favor healthy co-dominant and dominant trees for retention, with the creation of 1/8 to 4 acre openings. Treatments in grassland areas would include cutting of ponderosa pine and pinyon-juniper to reduce tree canopy cover to less than 10% in grassland areas. Areas within MSO PACs will be managed to promote the primary constituent elements for nesting, roosting, foraging, and dispersing. This includes the development of a mosaic of uneven-aged forest stands with an increased herbaceous understory by diversifying the current homogenous conditions on the landscape. Treatments in MSO habitat will focus on the removal of small trees to reduce competition and increase nutrients for larger trees, create gaps and openings in the canopy, and reduce fire risk to current nest/roost habitat. Thinning in PACs would not decrease the basal area (BA) below threshold conditions outlined in the 2012 Recovery Plan for both Ponderosa pine/Gambel oak (110 BA) and mixed conifer (120 BA).

While the proposed mechanical treatments are expected to have long-term benefits to key habitat components of MSO habitat, short-term adverse effects from these treatments are likely to occur. These short term adverse effects relate to modifications in structure and composition of the forest within nest/roost habitat and across the landscape in recovery habitat.

In conjunction with the proposed mechanical treatment, the Forest will be conducting monitoring within treatment and control PACs. They have established one group of treatment PACs and one group of control PACs which share similar vegetative characteristics. Prior to treatment within a PAC, monitoring would occur for 2 years, followed by 3 years of monitoring post-treatment within the treatment PAC and a corresponding control PAC to document and compare results (Table 8). Details of the monitoring protocol will be developed in coordination with the Service prior to project implementation.

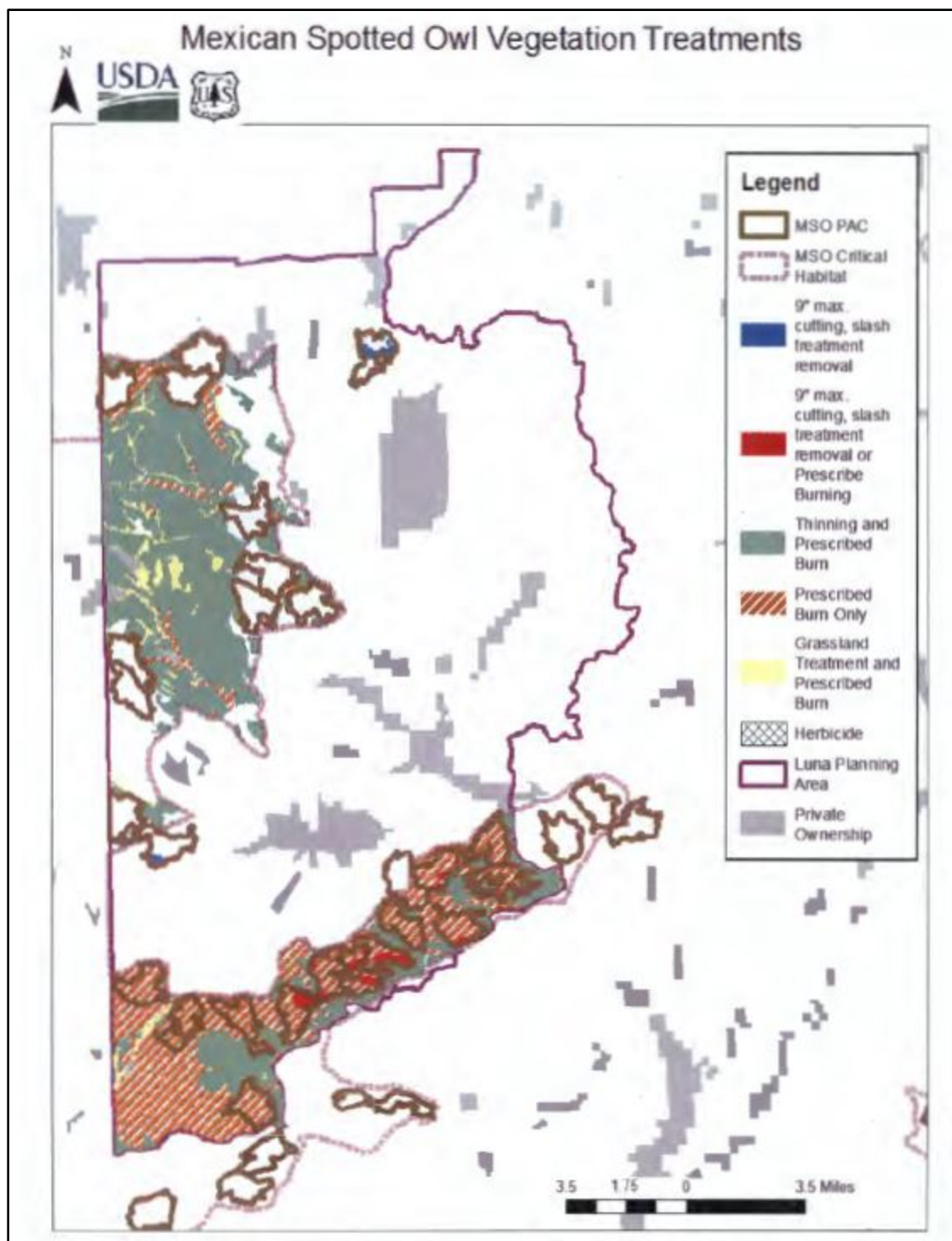


Figure 4. Vegetation treatments within MSO PACs for the Luna Restoration Project.

Table 6. Total acres and percentages of Protected Activity Centers that will be affected by mechanical treatments and prescribed burning as part of the Luna Restoration Project.

PAC Name	Total PAC Acres	Total Core Acres	Mechanical Treatment (Thinning < 9 inch dbh)			Prescribed Burning (Mixed Severity)			Prescribed Burning (Low Intensity)		
			PAC Acres Treated	% PAC Treated	% Core Treated	PAC Acres Treated	% PAC treated	% Core Treated	PAC Acres Treated	% PAC Treated	% Core Treated
Bill Knight	660	100?	266	40	0	169	26	0	660	100	100
Divide	676	123	187	28	0	508	75	0	676	100	100
Frieborn	678	99	0	0	0	669	100	100	678	100	100
Horse Mesa	633	108	0	0	0	633	100	100	633	100	100
H-V 1	632	136	0	0	0	632	100	100	632	100	100
Laney Spring	603	146	211	35	0	401	67	0	603	100	100
Lily 1	610	137	0	0	0	610	100	100	610	100	100
Lily 2	611	106	73	12	0	611	100	100	611	100	100
Lily 3	612	108	59	10	0	564	92	0	612	100	100
Lily 4	638	137	0	0	0	638	100	100	638	100	100
Lily 5	749	98	0	0	0	741	100	100	749	100	100

Table 6. Total acres and percentages of Protected Activity Centers that will be affected by mechanical treatments and prescribed burning as part of the Luna Restoration Project.

PAC Name	Total PAC Acres	Total Core Acres	Mechanical Treatment (Thinning < 9 inch dbh)			Prescribed Burning (Mixed Severity)			Prescribed Burning (Mixed Severity)		
			PAC Acres Treated	% PAC Treated	% Core Treated	PAC Acres Treated	% PAC Treated	% Core Treated	PAC Acres Treated	% PAC Treated	% Core Treated
Lower Left Hand Canyon	655	131	137	21	0	537	82	0	655	100	100
Mail	635	130	0	0	0	635	100	100	635	100	100
Swapp Booth 2	648	121	102	16	0	0	0	0	648	100	100
Swapp Booth 3	662	131	0	0	0	662	100	100	662	100	100
Upper Left Hand Canyon	645	102	275	43	0	389	60	0	645	100	100
Totals	10,347	1913	1310	13	0	8399	81	56	10,347	100	100

Table 7. Total acres of protected and recovery habitat and associated mechanical treatments and/or prescribed burning as part of the Luna Restoration Project.

Type of Treatment	Protected Habitat (PACs)	Recovery Habitat Acres	Total Acres
Group Selection and Thinning + Prescribed Burning + Herbicide	0	3450	3450
Group Selection and Thinning + Prescribed Burning	0	9471	9471
Group Selection and Thinning	0	57	57
Improvement Thinning + Prescribed Burning + Herbicide	0	1023	1023
Improvement Thinning + Prescribed Burning	0	3356	3356
Improvement Thinning	0	49	49
Small Tree Thinning + Prescribed Burn	948	0	948
Small Tree Thinning	371	0	371
Meadow Maintenance and Restoration	0	799	799
Prescribed Burning	8399	9676	18,075

Prescribed Burning

Of the total 26 PACs within the action area, comprising 16,717 acres, mixed severity prescribed burning will occur on approximately 8,399 PAC acres (approximately 50%) in the action area. Specifically, this will impact 15 out of the 26 PACs (approximately 58%) within the action area (Bill Knight, Swapp Booth 3, Horse Mesa, Frieborn, Mail, Divide, Lower Left Hand Canyon, Upper Left Hand Canyon, Laney Spring, Lily 2, Lily 3, Lily 4, Lily 5, and H-V 1) (Figure 4; Table 6).

Outside of PACs, there are approximately 32,042 acres of recovery habitat with 6,984 acres that are managed for nest/roost replacement and 25,058 acres that are managed as foraging/non-breeding habitat. Within recovery habitat, prescribed burning will occur on approximately 9,676 acres of recovery habitat (Table 7).

Mixed severity prescribed fire is proposed to treat natural fuels (i.e., dead and live vegetation) and activity fuels (i.e., limbs from thinning projects). Mixed severity fires are intended to burn in a mosaic pattern across the landscape, which leads to a highly variable pattern of mortality on the landscape and helps foster development of diverse communities. The goal of this mixed severity prescribed fire is to create pockets of tree mortality, while reducing surface and ladder fuels. Low severity prescribed fire is proposed in areas that have limited access, steep topography, sensitive soils, high fuel loads, and a potential for high severity wildfires. The goal of this low severity prescribed fire is to reduce surface and canopy fuels.

Prescribed fire would be implemented in any season of the year, provided the appropriate weather and fuel conditions exist. Treatments in MSO PACs should occur during the non-breeding season, unless non-breeding is confirmed that year per accepted protocol. Prescribed fire ignitions within MSO PACs would not occur within the 100 acre core area; however, prescribed fire will be allowed to move into and through core areas when conditions assure low fire severity and intensity (Figure 5).

The goal of prescribed fire is to create un-even aged, multi-storied tree communities within MSO habitat and reduce the risk of high-severity crown fire. Nevertheless, research has shown that large logs, snags, large trees, and Gambel oaks- all key habitat components of MSO habitat- may be damaged during these activities (Horton and Mannan 1988). Design features will be implemented in an attempt to minimize these losses; however, it is difficult to both reduce and protect fuels across the same area. While the proposed prescribed fire treatments are expected to have long-term benefits to key habitat components of MSO habitat, short-term adverse effects from these treatments are likely to occur. These short-term adverse effects relate to the likelihood that key MSO habitat components may be unintentionally lost to fire.

Table 8. Mexican spotted owl Protected Activity Centers grouped based on similar vegetation characteristics, which will be used for post-treatment monitoring for the Luna Restoration Project action area.

MSO PAC	Group 1	Group 2
Bill Knight		X
Bishop Canyon	X	
Bishop Peak	X	
Cap Mamie 1	X	
Cap Mamie 2		X
Cap Mamie 3		X
Divide	X	
Frieborn		X
Horse Mesa	X	
H-V 1	X	
Laney Spring	X	
Lily 1		X
Lily 2	X	
Lily 3		X
Lily 4		X
Lily 5		X
Lower Left Hand Canyon	X	
Mail	X	
SA Creek		X

Table 8. Mexican spotted owl Protected Activity Centers grouped based on similar vegetation characteristics, which will be used for post-treatment monitoring for the Luna Restoration Project action area.

MSO PAC	Group 1	Group 2
Sand Creek	X	
Swapp Booth 1	X	
Swapp Booth 2		X
Swapp Booth 3	X	
Swapp Booth 4		X
Turner Peak	X	
Upper Left Hand Canyon	X	

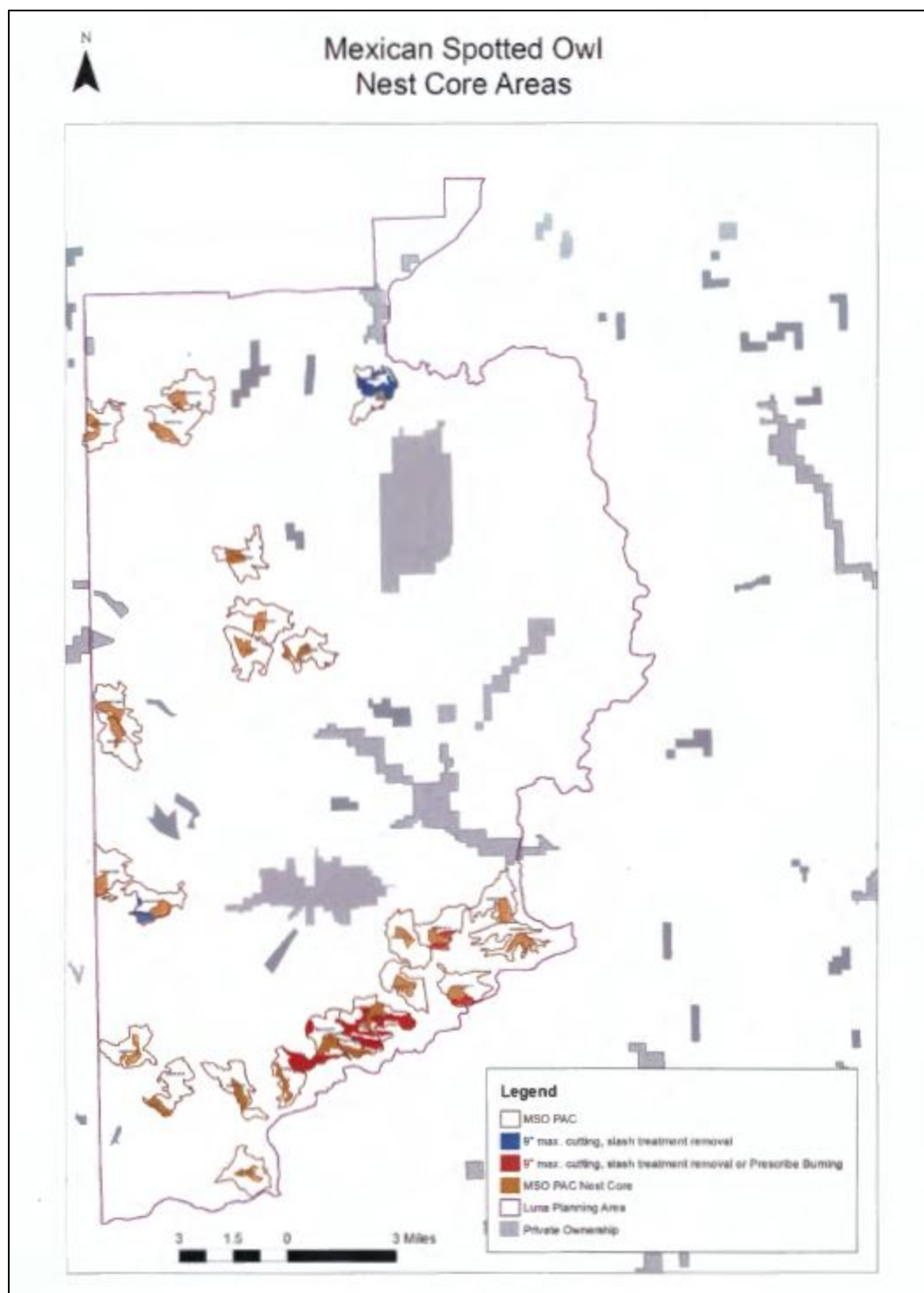


Figure 5. Mexican Spotted Owl Nest Core locations, along with treatment types occurring within, for the Luna Restoration Project.

Herbicide Treatment

Herbicide treatment will not occur within MSO PACs. Outside of PACs, there are approximately 1,270 acres of MSO recovery habitat proposed for herbicide utilization in conjunction with thinning of juniper. The goal of treating juniper with herbicide is to reduce competition with ponderosa pine and mixed conifer species. This treatment will ultimately aid in the development of habitat components for MSO habitat in the long term; however, the reduction of juniper may also decrease food availability for prey species, thereby potentially creating short term adverse effects for the MSO via impacts to prey availability.

Road Decommissioning

Approximately 6.08 miles of roads will be decommissioned within MSO PACs, with an additional 41.12 miles of roads outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). Decommissioning includes utilization of heavy equipment to install signs, gates, rock barriers, or to rip and re-contour slopes and install drainage features. In the long term, decommissioning of roads is assumed to prevent cross country travel of motorized vehicles, allowing for more vegetation to establish in these areas. This could, over time, help provide additional habitat for MSO prey. Any immediate direct effects to the MSO will be avoided based on breeding season restrictions.

Temporary Road Construction

Approximately 2.0 miles of temporary roads will be constructed outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). Temporary road construction could remove some trees, with smaller trees given preference for removal, thus altering MSO habitat in the short term. In the long term, these roads will allow for the removal of fuels in areas that have a high likelihood of high severity wildlife, thereby allowing for the protection and future enhancement of MSO habitat.

Fence Construction

Approximately 0.87 miles of fence constructions will occur within PACs, with an additional 0.23 miles of fence outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). These will be constructed outside of breeding season to limit direct effects from noise disturbance. Fence construction should not appreciably impact MSO habitat in the short term and will ultimately aid in livestock distribution, which can be beneficial to MSO prey habitat.

Pipeline Construction

Approximately 4.5 miles of pipeline construction will occur outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). These will be constructed outside of breeding season to limit direct effects from noise disturbance. Pipeline construction should not appreciably impact MSO habitat in the short term and will ultimately aid in livestock distribution, which can be beneficial to MSO prey habitat.

Wells and Water Systems Development

Approximately 5 wells and the associated water system will be developed outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). These structures will be constructed outside of breeding season to limit direct effects from noise disturbance.

Construction should not appreciably impact MSO habitat in the short term and will ultimately aid in livestock distribution, which can be beneficial to MSO prey habitat.

Stream Crossing Improvements

Approximately 2 stream crossing improvements will occur outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). These improvements will be constructed outside of breeding season to limit direct effects from noise disturbance. These improvements should not appreciably impact MSO habitat and will ultimately lead to watershed improvement, which can be beneficial to MSO prey habitat.

Stream Sedimentation Structures

Approximately 1 stream sedimentation structure will be constructed outside of PACs but within MSO designated critical habitat (Tables 9 and 10; Figure 6). This structure will be constructed outside of breeding season to limit direct effects from noise disturbance. This structure should not appreciably impact MSO habitat and will ultimately lead to watershed improvement, which can be beneficial to MSO prey habitat.

Conversion of Closed Road to Open Road

Approximately 0.2 miles of Forest Road 4127 W which has been administratively closed will be converted to “open to motorized vehicles”, which falls within MSO designated critical habitat. The road base is already present, thus, opening the road would not require any new construction. This action is predominantly administrative in nature as the route was incorrectly closed during a 2013 Travel Management Decision. The conversion of this road to an open motorized route may increase overall noise levels in the area or increase the likelihood of collisions between owls and motorized vehicles; however, this is not anticipated to appreciably negatively impact owls due to the limited scope.

Summary of Effects

The Service identified up to 15 PACs which may be affected by the Luna Restoration Project. Of those 15 PACs, eight PACs will receive mechanical vegetation treatment, 15 PACs will undergo mixed severity prescribed burning, with 7 PACs receiving a combination of these treatments (Table 6). In addition, of those 15 PACs, 2 PACs will have some form of range improvement and 12 PACs will be affected by road construction or rehabilitation (Table 9). However, work associated with both range improvements and road construction or rehabilitation will occur outside the breeding season and habitat will not be modified to the extent that there would be incidental take as a result of this aspect of the proposed action in these PACs.

Table 9. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring within Mexican Spotted Owl Protected Activity Centers for the Luna Restoration Project.

MSO PAC	Decommission Road (mi)	Fence Construction (mi)	Pipeline (mi)	Motorized Trail Reroute (mi)	Drill Well and Develop Water System (system)
Bill Knight	0	0	0	0	0
Bishop Canyon	0.76	0	0	0	0
Bishop Peak	0.61	0	0	0	0
Cap Mamie 1	0	0	0	0	0
Cap Mamie 2	0	0.06	0	0	0
Cap Mamie 3	1.08	0.81	0	0	0
Divide	0	0	0	0	0
Frieborn	0	0	0	0	0
Horse Mesa	0	0	0	0.1	0
H-V 1	0	0	0	0	0
Laney Spring	0.15	0	0	0	0
Lily 1	0	0	0	0	0
Lily 2	0.06	0	0	0	0
Lily 3	0.36	0	0	0	0
Lily 4	0	0	0	0	0
Lily 5	0	0	0	0	0
Lower Left Hand Canyon	0	0	0	0	0

Table 9. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring within Mexican Spotted Owl Protected Activity Centers for the Luna Restoration Project.

MSO PAC	Decommission Road (mi)	Fence Construction (mi)	Pipeline (mi)	Motorized Trail Reroute (mi)	Drill Well and Develop Water System (system)
Mail	0.03	0	0	0	0
SA Creek	1.02	0	0	0	0
Sand Creek	0.33	0	0	0	0
Swapp Booth 1	0	0	0	0	0
Swapp Booth 2	0	0	0	0	0
Swapp Booth 3	0	0	0	0	0
Swapp Booth 4	0.63	0	0	0	0
Turner Peak	1.05	0	0	0	0
Upper Left Hand Canyon	0	0	0	0	0
Total	6.08	0.87	0	0.1	0

Table 10. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring outside Mexican Spotted Owl Protected Activity Centers but within critical habitat for the Luna Restoration Project.

Activity Description	Amount
Decommission Road (mi)	47.2
Construct Temporary Road (mi)	2.0
Fence Construction (mi)	1.1
Pipeline (mi)	4.5
Motorized Trail Reroute (mi)	0.1
Drill Well and Develop Water Systems (systems)	5
Motorized Trail Stream Crossing Improvement (number)	2
Sediment Structures (number)	1
Motorized Use Barrier (number)	1
Convert Closed Road to Open to Motorized Use (miles)	0.2

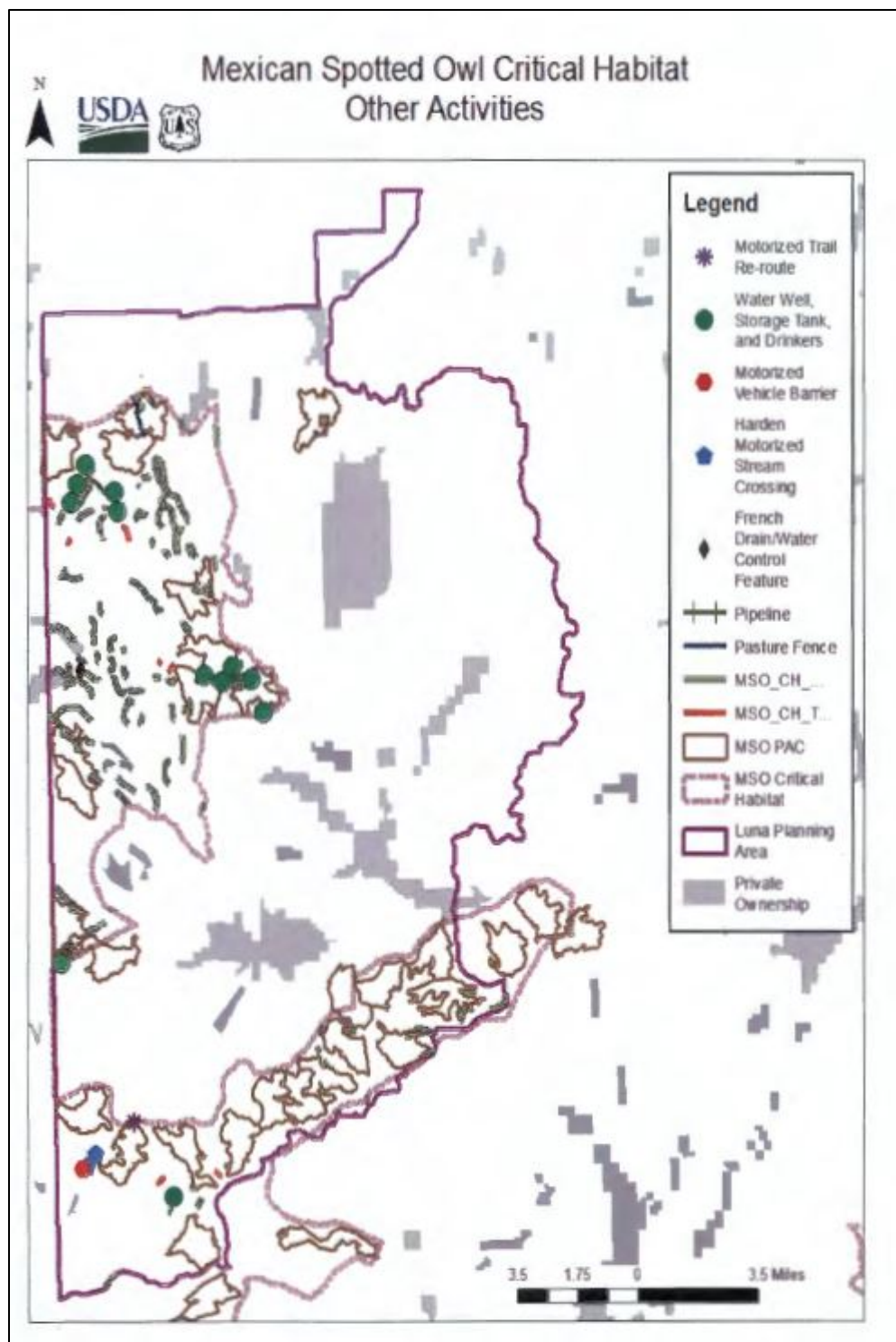


Figure 6. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring within Mexican Spotted Owl habitat for the Luna Restoration Project.

Interdependent or Interrelated Effects

There are no expected interdependent or interrelated effects from this project to the Mexican spotted owl.

Designated MSO Critical Habitat

PCE I: A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with dbh (1.4 m or 4.5 feet above ground) of 30.5 cm (12 in) or more.

Effects on PCE I in Action Area: Actions implemented under the proposed action are expected to retain a range of tree species, including mixed conifer, pine-oak, and riparian forest types, of different tree sizes. Some loss of tree of all types and dbh size classes will occur via mechanical treatments and prescribed fire; however, through the implementation of 2012 MSO Recovery Plan guidelines, the Forest will strive to retain large trees, appropriate canopy cover, and a diverse range of tree species. Specifically, based on vegetation modeling described in the BA, it is anticipated that 10 years post-mechanical treatment, the percentage of ponderosa pine trees with >12 inches dbh will have increased by approximately 10% (from 55.3% to 65.8%) and an additional 4% by 20 years post-mechanical treatment (from 65.8% to 69.06%). It is also anticipated that 10 years post-mechanical treatment, the percentage of mixed conifer trees with >12 inches dbh will have increased by approximately 8% (from 55.7% to 63.5%) and an additional 13% by 20 years post-mechanical treatment (from 63.5% to 73.4%). This progression towards larger trees will help to enhance this PCE. In addition, it is anticipated that the basal area of oaks will increase slightly over this 20 year period (from 2.71% to 3.25% in Ponderosa pine forests; from 1.12% to 1.26% in mixed conifer forests). This slight increase in oak components will aid in enhancing the diversity of tree species within MSO habitat. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE II: A shade canopy created by the tree branches covering 40 percent or more of the ground.

Effects on PCE II in Action Area: Actions implemented under the proposed action are expected to reduce tree shade canopy in the short term. Specifically, based on vegetation modeling described in the BA, canopy cover in Ponderosa pine is expected to be immediately (i.e., within the first 5 years) reduced from 42% to 38.05%. Canopy cover in mixed conifer is expected to be immediately reduced from 46.01% to 35.6%. However, both of these forest types are expected to see increased canopy cover 20 years post-treatments (up to 40.33% in Ponderosa pine and 38.15% in mixed conifer). While one particular forest type may decrease in canopy cover below 40%, the overall average canopy cover is not anticipated to fall below 40%, especially since the Forest will be implementing 2012 MSO Recovery Plan guidelines that include managing for higher basal area and increased canopy cover in MSO habitat. In addition, it is anticipated that some reduction in existing canopy cover (i.e., 5 to 10%) may aid in increasing understory herbaceous vegetation and forb production, which could benefit MSO prey species. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE III: Large, dead trees (snags) with a dbh of at least 30.5 cm (12 in).

Effects on PCE III in Action Area: Actions implemented under the proposed action may result in both the creation and loss of large snags (Horton and Mannan 1998, Randall-Parker and Miller 2002). Snags could be created as large and small trees are killed via prescribed burning. This may benefit MSO prey species as most snags that are created through prescribed burning tend to be <9 inches dbh (Saab et al. 2006). Snags used by MSOs for nesting are typically very old, large dbh, highly decayed snags with cavities. Based on vegetation modeling presented in the BA, there are approximately 6.65 snags per acre (>12 inches dbh) within Ponderosa pine and 7.58 snags per acre (>12 inches dbh) in mixed conifer. It is anticipated that there will be a measurable loss of snags via the proposed action (e.g., approximately 4 snags per acre in Ponderosa pine and approximately 5 snags per acre in mixed conifer 20 years post-treatment). To minimize this loss, the Forest will implement conservation measures to conserve large snags on the landscape, where possible. Thus, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE IV: High volumes of fallen trees and other woody debris.

Effects on PCE IV in the Action Area: Actions implemented under the proposed action may result in the reduction of fallen trees and woody debris, especially since the reduction of coarse woody debris is a large component of the proposed action. The loss of large logs may result in short-term adverse effects to this PCE and could result in localized impacts to prey species habitat. On the other hand, it is likely that prescribed burning would also create fallen trees and woody debris as trees are killed and fall post-burn. Ultimately, based on information presented in the BA, there is likely an overabundance of coarse woody debris in the action area. This overabundance can increase the likelihood of high-severity fire within MSO habitat; therefore, the removal of some woody debris would result in an overall long-term benefit to MSO habitat despite any short-term adverse effects. Thus, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE V: A wide range of tree and plant species, including hardwoods.

Effects on PCE V in the Action Area: Actions implemented under the proposed action are anticipated to enhance this PCE. Plant species richness would increase following mechanical and prescribed burning treatment that focus on the creation of openings in the canopy. In addition, the proposed action is anticipated to result in a slight increase in oaks within both Ponderosa pine and mixed conifer forest types. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE VI: Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

Effects on PCE VI in the Action Area: Actions implemented under the proposed action may result in short-term decreases in plant cover as a result of prescribed burning. However, it is expected that long-term increases in residual plant cover will occur as a result of the removal of a thick layer of dead plant debris via prescribed burning. This removal of debris will allow for

suitable conditions to encourage increased herbaceous plant growth. In addition, the mosaic effect created via prescribed burning and the creation of canopy openings via mechanical treatments is expected to increase herbaceous plant species diversity (Jameson 1967, Moore et al. 1999, Spring et al. 2001) and, in turn, assist in the production and maintenance of MSO prey base. There is the potential for wild and domestic ungulates to have adverse effects on the production of plant cover post-burning if ungulates are allowed to graze burned areas immediately following fire; however, the Forest has included conservation measures to maintain healthy levels of forage in relation to livestock grazing. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

Designated Flycatcher Critical Habitat

PCE I: Riparian vegetation. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer's willow (*Salix geyeriana*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), pacific willow (*Salix lucida*), boxelder (*Acer negundo*), tamarisk (*Tamarix* spp.), Russian olive (*Eleagnus angustifolia*), buttonbush (*Cephalanthus* spp.), cottonwood (*Populus* spp.), stinging nettle (*Urtica dioica*), alder (*Alnus* spp.), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus* spp.), seep willow (*Baccharis salicifolia*), oak (*Quercus* spp.), rose (*Rosa* spp.), sycamore (*Platanus* spp.), false indigo (*Baptisia australis*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans* spp.) and some combination of:

- **PCE I (a):** Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 m (about 6 to 98 ft). Lower-stature thickets [2 to 4 m (6 to 13 ft) tall] are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests.
- **PCE I (b):** Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
- **PCE I (c):** Sites for nesting that contain a dense (about 50–100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
- **PCE I (d):** Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 acres) or as large as 70 ha (175 acres).

Effects on PCE I (a-d): Direct effects to riparian vegetation are expected to occur as a result of the proposed action. While no riparian vegetation is targeted for removal via mechanical thinning, installation of the irrigation ditch diversion at the Head of the Ditch Campground could

result in the removal of willows and cottonwoods. The realignment of one existing road within the action area may also result in the removal of some riparian vegetation during construction. Both of these actions should occur within less than an acre footprint. On the other hand, decommissioning roads in the action area will allow for revegetation, which could allow more willow species to establish. This revegetation has the potential to reduce habitat fragmentation. In addition, prescribed burning activities associated with the proposed action that will occur adjacent to areas of critical habitat will help reduce the threat of devastating wildfire, which could protect areas of critical habitat and allow the development of this PCE. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE II: Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

Effects on PCE II: The proposed action could impact this PCE indirectly via the removal of some riparian vegetation. However, the changes are not anticipated to be significant due to the limited scope of removal and the implementation of conservation measures designed to restore any riparian vegetation removed by planting of native species. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

Narrow-headed Gartersnake

Direct Effects

Direct effects include the low likelihood that vehicle mortality could occur during the construction of diversion structures and hardening of stream crossings. In addition to the low probability of direct mortality, areas where project activities (i.e., stream improvements) could have a direct effect to snakes if present (i.e., crushing) will be surveyed prior to implementation.

Indirect Effects

The following project activities have the potential to create indirect effects to the gartersnake via the introduction of sediment into the stream: mechanical thinning, prescribed burning, stream crossing improvement, construction of trail barriers, decommissioning of roads, temporary road construction, and construction of water wells and other associated infrastructure (Figures 7 and 8). Any introduction of sediment into the stream may affect the density of prey species of the gartersnake within the stream, thereby negatively impacting gartersnake survival.

Mechanical Thinning and Prescribed Burning

Of the 2,781 acres of gartersnake habitat within the action area, approximately 2,132 acres will undergo mechanical thinning, with 341 acres that will undergo meadow and riparian restoration treatments. In addition, approximately 3,509 acres within and adjacent to gartersnake habitat will undergo prescribed burning, with 1,070 acres remaining untreated. Mechanical thinning could lead to temporary changes to upland habitat which may be used for gestation, hibernation,

or brumation. Prescribed burning, in combination with the mechanical thinning, has the potential to introduce sediment into the stream, which may impact prey base for the gartersnake.

Stream Crossing Improvements and Construction of Trail Barriers

There will be a total of 7 stream crossing improvements (i.e., relocation and/or hardening of stream crossing) within gartersnake habitat: 1 on the San Francisco River at Head of Ditch Campground and 6 along Dry Blue Creek. In addition, 2 temporary barriers will be installed along Dry Blue Creek during stream improvement construction. The construction of these stream crossing improvements has the potential to introduce sediment into the stream during construction, which may impact prey base for the gartersnake.

Decommissioning of Roads, Temporary Road Construction, and Construction of Water Wells

There are approximately 6 different segments of roads that will be decommissioned within gartersnake habitat. Temporary road construction will occur at least 1 mile away from gartersnake habitat, as well as the construction of water wells and other associated infrastructure. Road decommissioning is anticipated to be beneficial to gartersnake habitat in the long term due to the re-establishment of vegetation, which would lead to a decreased sediment input into nearby bodies of water, aiding in increasing available gartersnake prey habitat. Any temporary road construction or water well construction adjacent to gartersnake habitat may indirectly lead to the introduction of sediment into the stream, which may impact prey base for the gartersnake.

Summary of Effects

In all of the above cases, the introduction of sediment into the stream could affect the density prey species of the gartersnake during the short term. Any introduction of sediment is expected to be temporary, with the expectation that the completion of proposed projects will result in decreased sediment intrusions into the stream in the long term.

Interdependent or Interrelated Effects

There are no expected interdependent or interrelated effects from this project to the gartersnake.

Proposed Narrow-headed Gartersnake Critical Habitat

PCE I: Stream habitat.

- **PCE I (a):** Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
- **PCE I (b):** A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
- **PCE I (c):** Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs,

debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and

- **PCE I (d):** Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

Effects on PCE I (a-d) in the Action Area: Short term effects to stream habitat are expected to occur as a result of the proposed action. Activities which have the potential to introduce sediment into the stream (i.e., mechanical thinning, prescribed burning, irrigation ditch construction, construction of trail barriers, decommissioning of roads, temporary road construction, and construction of water wells and other associated infrastructure) could impact PCE I (a) in the short term by altering the amounts of fine sediment embeddedness. The likelihood of major sediment input from mechanical thinning and prescribed burning is low as the live vegetation present between areas where these proposed activities will occur and areas of proposed gartersnake critical habitat would act as a filter. Any sediment input from the construction of the irrigation ditch diversion, water wells, and other associated infrastructure is expected to be minimal and temporary and should flush quickly with normal stream flow.

Mechanical thinning and prescribed fire activities are intended to reduce the risk of severe wildland fires, which typically introduce large amounts of ash, sediment, and debris into waterways. The construction of the irrigation ditch diversion would be designed to allow aquatic passage, as well as allow excess water back into the San Francisco River when irrigation needs are met. The construction of trail barriers would reduce future sediment entering waterways by stabilizing the entry and exit points for recreational traffic. Decommissioning of roads would allow for future revegetation, which can reduce sediment input to waterways as well. In the long term, these actions are expected to benefit the stream habitat by contributing to the integrity of flow regimes and shoreline habitat in the action area (PCE I (b) and (c)).

PCE II: Adequate terrestrial space (600 ft., 182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

Effects on PCE II in the Action Area: The BA does not present specific information relating to the effects on PCE II in the action area. Nevertheless, it is anticipated that effects to PCE II will be insignificant due to the limited presence of heavy equipment within gartersnake habitat, which will reduce impacts to terrestrial space within riparian areas.

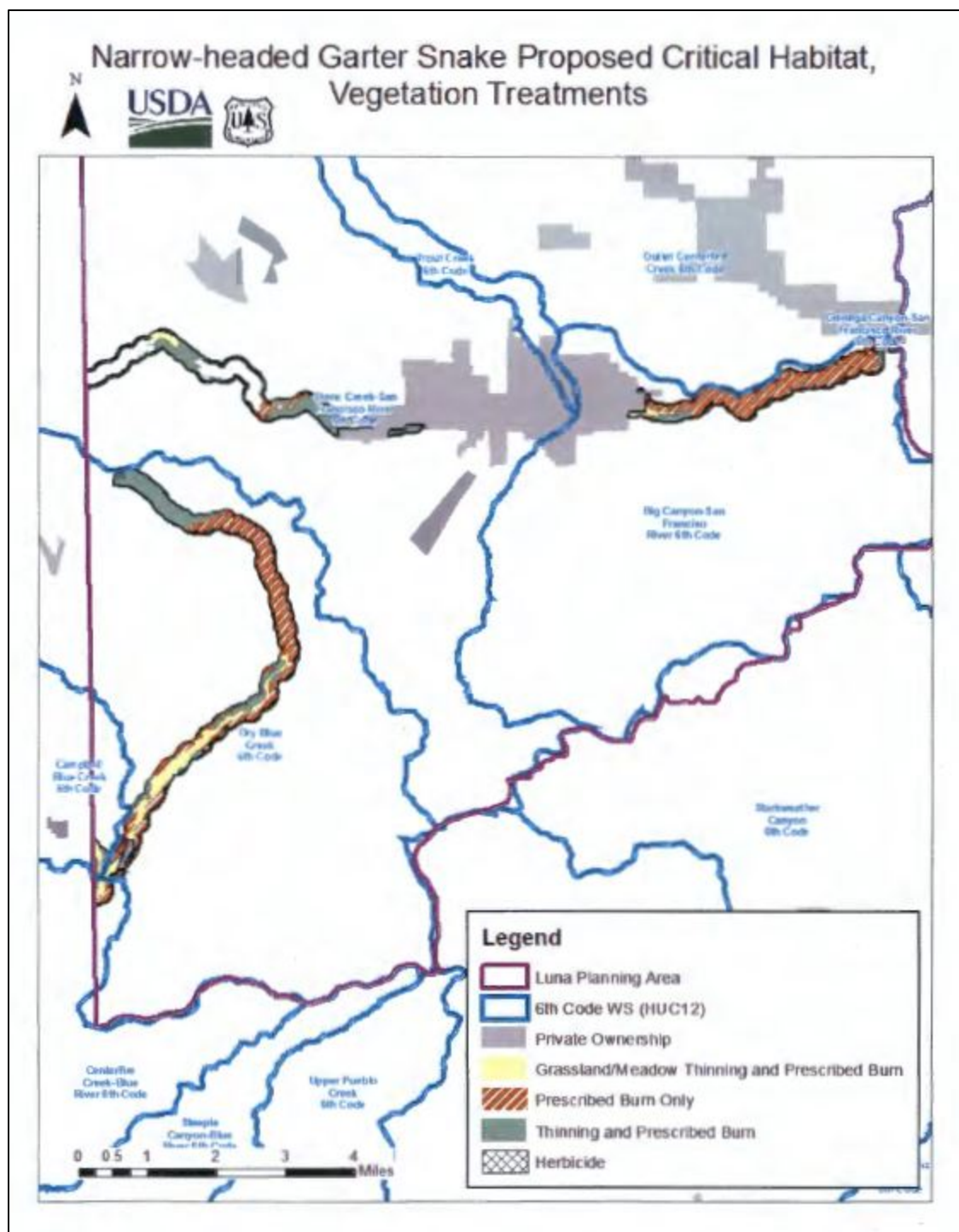


Figure 7. Vegetation treatments within gartersnake habitat for the Luna Restoration Project .

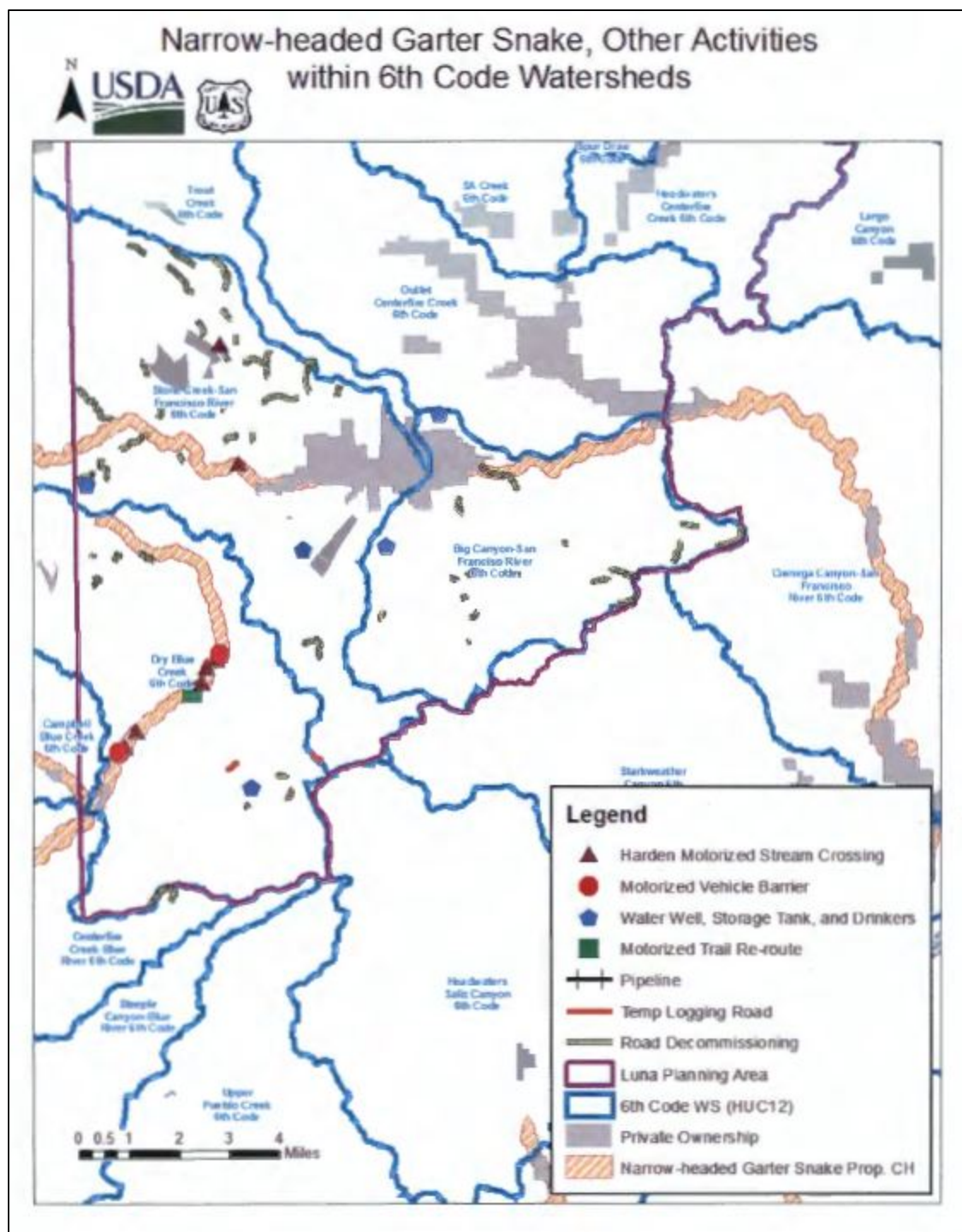


Figure 8. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring within gartersnake habitat for the Luna Restoration Project.

Loach Minnow

Direct Effects

Direct effects include the low likelihood that vehicle mortality could occur during the construction of diversion structures and hardening of stream crossings. To minimize the low probability of direct mortality, block nets will be placed both upstream and downstream of the site and fish will be removed via electroshocking and moved upstream prior to project commencement.

Indirect Effects

The following project activities have the potential to create indirect effect to the loach minnow via the introduction of sediment into the stream: mechanical thinning, prescribed burning, stream crossing improvements, construction of trail barriers, decommissioning of roads, temporary road construction, and construction of water wells and other associated infrastructure (Figures 9 and 10). Any input of sediment into the stream can lead to negative impacts to loach minnow habitat and density of prey species, thereby impacting loach minnow survival.

Mechanical Thinning and Prescribed Burning

Along the 5.6 stream miles of loach minnow habitat within the action area, approximately 22 acres will undergo mechanical thinning, with 219 acres that will undergo meadow and riparian restoration treatments. In addition, approximately 372 acres will undergo prescribed burning. Prescribed burning, in combination with the mechanical thinning, has the potential to introduce sediment into the stream, which may impact prey base for the loach minnow.

Stream Crossing Improvements and Construction of Trail Barriers

There will be a total of 2 stream crossing improvements (i.e., relocation and/or hardening of stream crossing) within loach minnow habitat along Dry Blue Creek. In addition, 1 temporary barrier will be installed within loach minnow habitat along Dry Blue Creek during stream improvement construction. The construction of these stream crossing improvements has the potential to introduce sediment into the stream during construction, which may impact prey base for the loach minnow.

Decommissioning of Roads, Temporary Road Construction, and Construction of Water Wells

Road decommissioning and temporary road construction will occur at least 1 mile away from loach minnow habitat, as well as the construction of water wells and other associated infrastructure. Road decommissioning is anticipated to be beneficial to loach minnow habitat in the long term due to the re-establishment of vegetation, which would lead to a decreased sediment input into nearby bodies of water, aiding in increasing available gartersnake prey habitat. Any temporary road construction or water well construction adjacent to loach minnow habitat may indirectly lead to the introduction of sediment into the stream, which may impact prey base for the loach minnow. .

Summary of Effects

In all of the above cases, the introduction of sediment into the stream could affect the density of prey species of the loach minnow during the short term. Any introduction of sediment is expected to be temporary, with the expectation that the completion of proposed projects will result in decreased sediment intrusions into the stream in the long term.

Interdependent or Interrelated Effects

There are no expected interdependent or interrelated effects from this project to the loach minnow.

Designated Loach Minnow Critical Habitat

PCE I: Permanent, flowing water with no or minimal pollutant levels.

- **PCE I (a, b, c):** Living areas for loach minnow adults, juveniles, and larvae with appropriate flow regimes and substrates.
- **PCE I (d):** Spawning areas with slow to swift flow velocities in shallow water where cobble and rubble and the spaces between them are not filled in by fine dirt or sand.
- **PCE I (e):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

Effects on PCE I (a-e) in the Action Area: The BA does not present specific information relating to the effects on PCE I in the action area. Nevertheless, it is anticipated that effects to PCE I will be insignificant due to implementation of conservation measures designed to limit the input of pollutants into the stream during project implementation.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

Effects on PCE II in the Action Area: Short term effects to stream habitat are expected to occur as a result of the proposed action. Activities which have the potential to introduce fine sediment into the stream (i.e., mechanical thinning, prescribed burning, irrigation ditch construction, construction of trail barriers, decommissioning of roads, temporary road construction, and construction of water wells and other associated infrastructure) could impact PCE II in the short term by altering the amounts of fine sediment embeddedness. The likelihood of major sediment input from mechanical thinning and prescribed burning is low as the live vegetation present between areas where these proposed activities will occur and areas of designated loach minnow critical habitat would act as a filter. Any sediment input from the construction of the irrigation ditch diversion, water wells, and other associated infrastructure is expected to be minimal and temporary and should flush quickly with normal stream flow.

Mechanical thinning and prescribed fire activities are intended to reduce the risk of severe wildland fires, which typically introduce large amounts of ash, sediment, and debris into waterways. The construction of the irrigation ditch diversion would be designed to allow aquatic passage, as well as allow excess water back into the San Francisco River when irrigation needs are met. The construction of trail barriers would reduce future sediment entering waterways by stabilizing the entry and exit points for recreational traffic. Decommissioning of roads would allow for future revegetation, which can reduce sediment input to waterways as well. In the long term, these actions are expected to benefit the stream habitat by contributing to the integrity of the stream habitat in the action area (PCE II).

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

Effects on PCE III in the Action Area: The BA does not present specific information relating to the effects on PCE III in the action area. Nevertheless, it is anticipated that effects to PCE III will be insignificant as aspects of the proposed action should not impact gradient of the stream, water temperature, pool/riffle ratio, nor the presence of abundant insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

Effects on PCE IV in the Action Area: The BA does not present specific information relating to the effects on PCE IV in the action area. Nevertheless, it is anticipated that the effects to PCE IV will be insignificant as aspects of the proposed action will not introduce any additional non-native aquatic species into the stream based on the implementation of conservation measures to avoid this event.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Effects on PCE V in the Action Area: The BA does not present specific information relating to effects on PCE V in the action area. Nevertheless, it is anticipated that the effects to PCE V will be insignificant as aspects of the proposed action should not impact the overall periodicity of water within the stream.

Designated Spikedace Critical Habitat

PCE I: Permanent, flowing water with no or minimal pollutant levels.

- **PCE I (a, b, c):** Living areas for spikedace adults, juveniles, and larvae with appropriate flow regimes and substrates.
- **PCE I (d):** Water with appropriate dissolved oxygen levels and minimum pollutant levels.

Effects on PCE I (a-d) in the Action Area: The BA does not present specific information relating to the effects on PCE I in the action area. Nevertheless, it is anticipated that effects to

PCE I will be insignificant due to implementation of conservation measures designed to limit the input of pollutants into the stream during project implementation.

PCE II: Sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness.

Effects on PCE II in the Action Area: Short term effects to stream habitat are expected to occur as a result of the proposed action. Activities which have the potential to introduce fine sediment into the stream (i.e., mechanical thinning, prescribed burning, irrigation ditch construction, construction of trail barriers, decommissioning of roads, temporary road construction, and construction of water wells and other associated infrastructure) could impact PCE II in the short term by altering the amounts of fine sediment embeddedness (Figures 9 and 10). Any input of sediment into the stream can lead to negative impacts to spikede habitat and density of prey species, thereby impacting loach minnow survival.

Along the 5.6 stream miles of spikede habitat within the action area, approximately, 22 acres within spikede critical habitat will undergo mechanical thinning, with 219 acres that will undergo meadow and riparian restoration treatments. In addition, approximately 372 acres will undergo prescribed burning. Prescribed burning, in combination with the mechanical thinning, has the potential to introduce sediment into the stream.

There will be a total of 2 stream crossing improvements (i.e., relocation and/or hardening of stream crossing) within spikede critical habitat along Dry Blue Creek. In addition, 1 temporary barrier will be installed within spikede critical habitat along Dry Blue Creek during stream improvement construction. The construction of these stream crossing improvements has the potential to introduce sediment into the stream during construction.

Road decommissioning and temporary road construction will occur at least 1 mile away from spikede critical habitat, as well as the construction of water wells and other associated infrastructure. Road decommissioning is anticipated to be beneficial to spikede critical habitat in the long term. Any temporary road construction or water well construction adjacent to loach spikede critical habitat may indirectly lead to the introduction of sediment into the stream.

The likelihood of major sediment input from mechanical thinning and prescribed burning is low as the live vegetation present between areas where these proposed activities will occur and areas of proposed gartersnake critical habitat would act as a filter. Any sediment input from the construction of the irrigation ditch diversion, water wells, and other associated infrastructure is expected to be minimal and temporary and should flush quickly with normal stream flow.

Mechanical thinning and prescribed fire activities are intended to reduce the risk of severe wildland fires, which typically introduce large amounts of ash, sediment, and debris into waterways. The construction of the irrigation ditch diversion will be designed to allow aquatic passage, as well as allow excess water back into the San Francisco River when irrigation needs are met. The construction of trail barriers will reduce future sediment entering waterways by stabilizing the entry and exit points for recreational traffic. Decommissioning of roads will allow for future revegetation, which can reduce sediment input to waterways as well. In the long term,

these actions are expected to benefit the stream habitat by contributing to the integrity of the stream habitat in the action area (PCE II).

PCE III: Streams with appropriate gradient, water temperature, pool/riffle ratios, and abundant aquatic insects.

Effects on PCE III in the Action Area: The BA does not present specific information relating to the effects on PCE III in the action area. Nevertheless, it is anticipated that effects to PCE III will be insignificant as aspects of the proposed action should not impact gradient of the stream, water temperature, pool/riffle ratio, nor the presence of abundant insects.

PCE IV: Habitat nearly devoid of nonnative aquatic species.

Effects on PCE IV in the Action Area: The BA does not present specific information relating to the effects on PCE IV in the action area. Nevertheless, it is anticipated that the effects to PCE IV will be insignificant as aspects of the proposed action will not introduce any additional non-native aquatic species into the stream based on the implementation of conservation measures to avoid this event.

PCE V: Areas within perennial, interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Effects on PCE V in the Action Area: The BA does not present specific information relating to effects on PCE V in the action area. Nevertheless, it is anticipated that the effects to PCE V will be insignificant as aspects of the proposed action should not impact the overall periodicity of water within the stream.

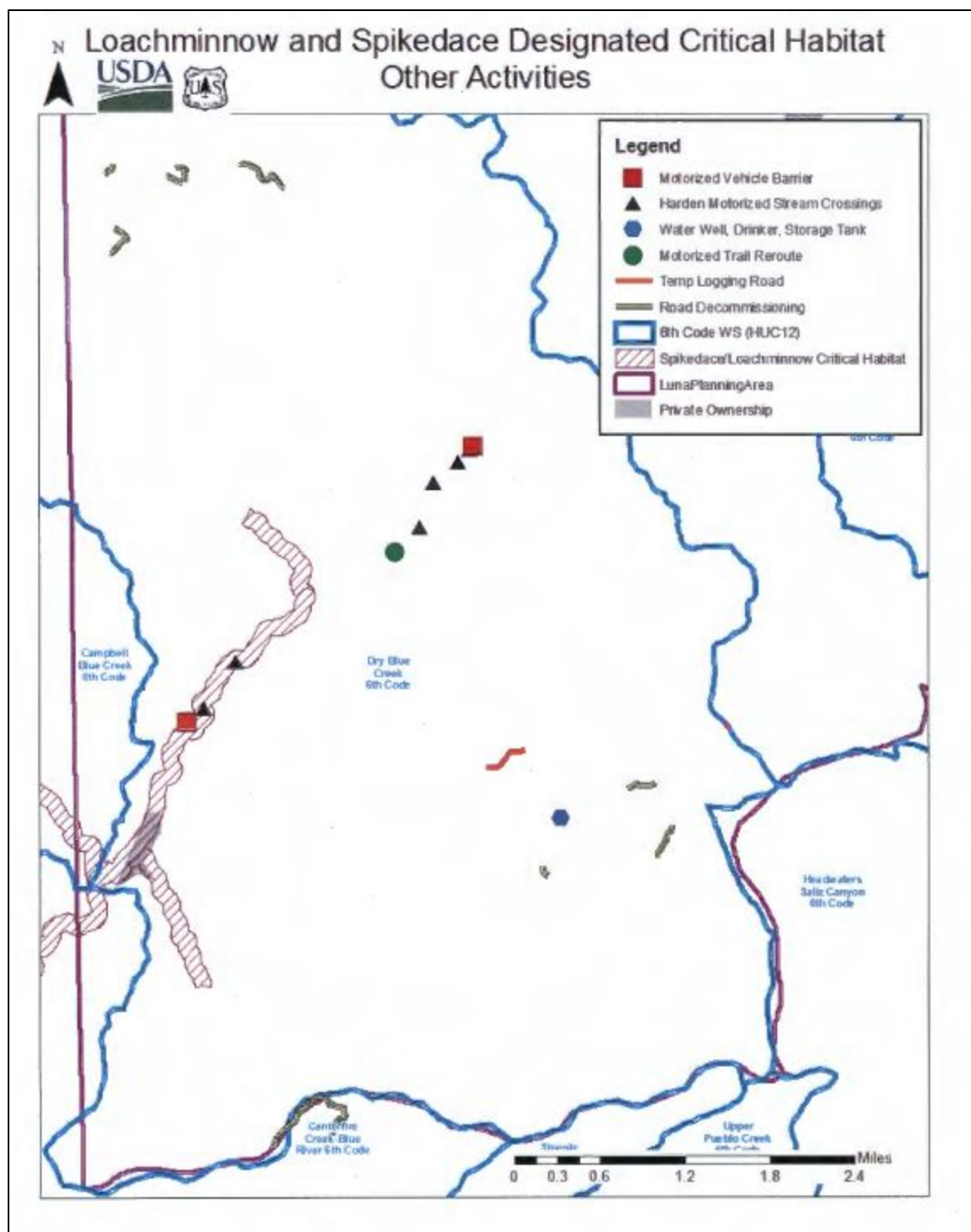


Figure 9. Vegetation treatments within loach minnow and spikedace habitat for the Luna Restoration Project.

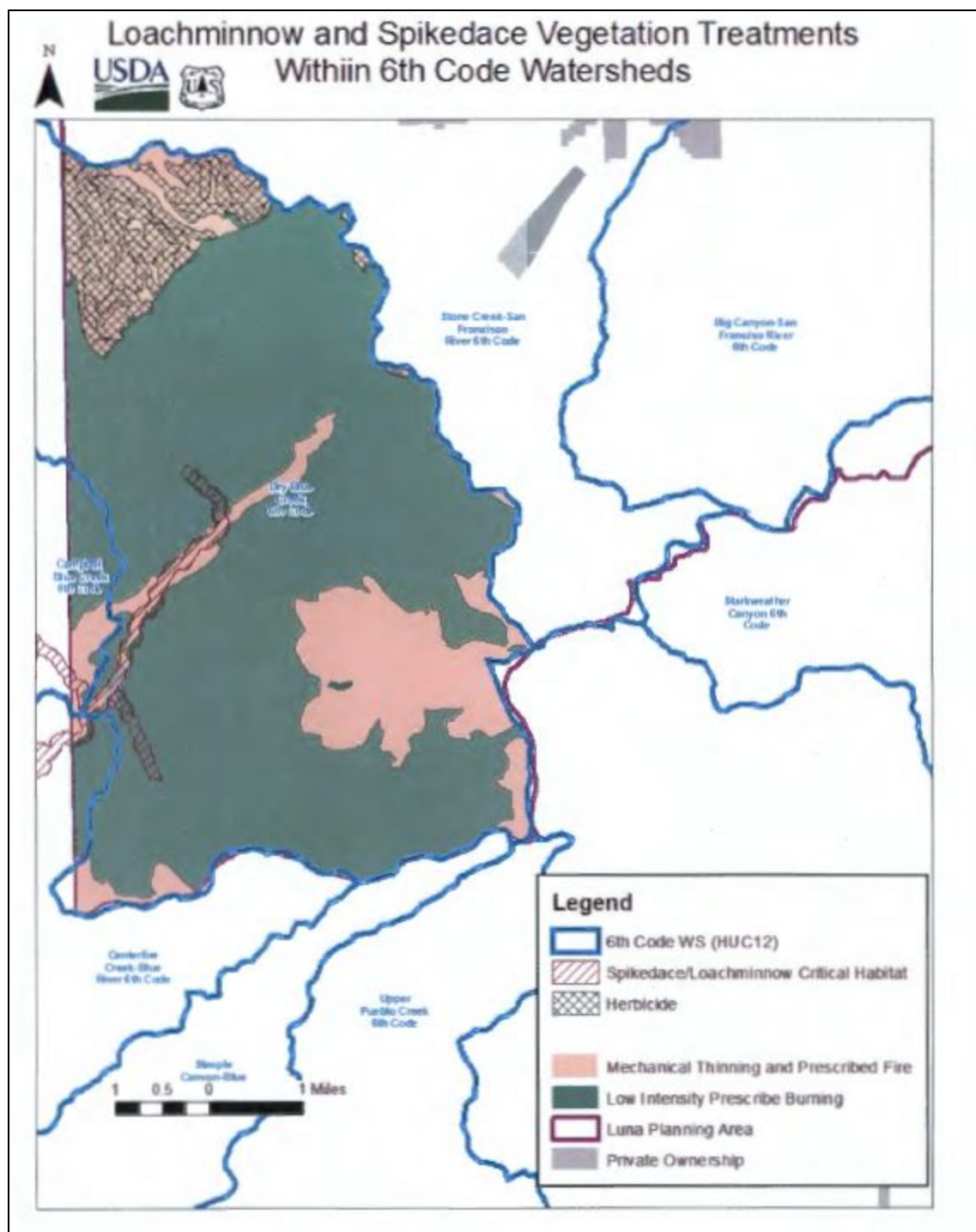


Figure 10. Other activities (e.g., road decommissioning, temporary road constructions, fence construction, etc.) occurring within loach minnow and spikedace habitat for the Luna Restoration Project.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. A cumulative effect which may be present within the action area and is common to all species analyzed involves the State's future management of wildlife. The action area falls within Game Management Unit 15 and 23. While the New Mexico Department of Game and Fish has few current comprehensive plans, management of wildlife populations has the potential to influence habitat conditions outside of the anticipated changes in livestock management and stocking rates in relation to the proposed action. Within the action area, an additional cumulative effect which may be present and is common to all species analyzed involves Catron County's maintenance responsibility for some road networks which are maintained with heavy equipment on a yearly basis. In addition, livestock grazing is anticipated to continue on private property. Maintenance of the Head of Ditch Campground diversion is completed by the Luna Ditch Association and will likely increase sediment input in Dry Blue Creek for short periods of time during and immediately after maintenance is completed. No other cumulative effects from state or private land are anticipated.

CONCLUSION

Jeopardize the continued existence of a species is defined as engaging in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02). "*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the PCE's essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR § 402.02; 81 FR 7214-7226).

Recovery is defined as the improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the ESA (50 CFR § 402.02).

This section presents the Service's opinion regarding whether the effects of the action, along with the interrelated and interdependent actions in the action area, in the presence of cumulative effects and given the overall range-wide status of the species, are likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

Mexican spotted owl and designated critical habitat

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued

existence of the Mexican spotted owl nor is it likely to destroy or adversely modify designated critical habitat within the Upper Gila Mountains EMU or rangewide. The Service also does not expect the effects of the proposed action to appreciably alter the function and intended conservation role of Mexican spotted owl critical habitat, nor is it expected to impede the survival or recovery of the Mexican spotted owl. The Service makes these findings for the following reasons:

1. The Luna Restoration Project will strive to implement the 2012 MSO Recovery Plan (Service 2012a) and manage for Mexican spotted owl recovery on the Gila National Forest.
2. Desired conditions and guidelines in the Luna Restoration Project recognize the need to reduce the potential for landscape level, stand-replacing fire within both ponderosa pine and mixed conifer forests which the Mexican spotted owl occupied. These efforts to improve forest condition and sustainability should reduce the risk of high severity fire and, subsequently, reduce the loss of owl habitat.
3. The Service found that some aspects of the proposed action (e.g., vegetation treatments, prescribed fire) have the potential to cause adverse effects (e.g., direct effects via the possibility of vehicle collisions and indirect effects via habitat alteration) to 15 out of 26 PACs in the action area. These 15 PACs represent approximately 1.5% of the MSO PACs, 1.5% of PAC acres, and 2% of total habitat within the Upper Gila Mountains Recovery Unit (UGM-7). Nevertheless, it is anticipated that these impacts will be short-term, and ultimately beneficial in the long-term as forest conditions improve. In addition, the overall acreage impacted is a relatively small percentage of the UGM-7 Mountains Recovery Unit (UGM-7) (i.e., approximately 64,293 acres out of 863,344 acres; approximately 7%). Therefore, the proposed action will not affect the role of critical habitat unit UGM-7 relative to the conservation of the Mexican spotted owl and to the overall critical habitat designation.

Southwestern willow flycatcher designated critical habitat

After reviewing the current status of the Southwestern willow flycatcher designated critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to destroy or adversely modify designated critical habitat. The Service makes this finding for the following reasons:

1. The Forest has identified suitable conservation measures (e.g., replanting of riparian vegetation) that will be incorporated into the proposed action, which will reduce impacts to flycatcher designated critical habitat.
2. Out of the total 21,235 acres within the San Francisco Management Unit and Upper Gila Management Unit of the Gila Recovery Unit, the action area contains 533 acres of flycatcher critical habitat. This equates to approximately 3% of the total management unit acreage. Therefore, the proposed action will not affect the role of the Gila Recovery Unit of designated critical habitat relative to the overall critical habitat designation.

Narrow-headed gartersnake and proposed critical habitat

After reviewing the current status of the narrow-headed gartersnake, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the narrow-headed gartersnake nor is it likely to destroy or adversely modify proposed critical habitat within the San Francisco Sub-basin or rangewide. The Service also does not expect the effects of the proposed action to appreciably alter the function and intended conservation role of gartersnake proposed critical habitat, nor is it expected to impede the survival or recovery of the gartersnake. The Service makes these findings for the following reasons:

1. The Forest has identified suitable conservation measures (e.g., replanting of riparian vegetation) that will be incorporated into the proposed action, which will reduce impacts to the gartersnake and its proposed critical habitat.
2. Out of the total 45,075 acres of proposed critical habitat within the San Francisco Sub-basin critical habitat unit, the action area contains 2,781 acres of proposed gartersnake critical habitat. This equates to approximately 6% of the entire proposed critical habitat unit. Therefore, the proposed action will not affect the role of the proposed San Francisco Sub-basin critical habitat unit relative to the conservation of the gartersnake and the overall proposed critical habitat designation.

Loach minnow and designated critical habitat

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the loach minnow nor is it likely to destroy or adversely modify designated critical habitat within the San Francisco and Blue River Complex or rangewide. The Service also does not expect the effects of the proposed action to appreciably alter the function and intended conservation role of loach minnow critical habitat, nor is it expected to impede the survival or recovery of the loach minnow. The Service makes these findings for the following reasons:

1. The Forest has identified suitable conservation measures (e.g., replanting of riparian vegetation) that will be incorporated into the proposed action, which will reduce impacts to the loach minnow and its designated critical habitat.
2. The Forest is also committed to translocation upstream of any loach minnow present in the action area prior to construction.
3. Out of the total 235.0 stream miles of designated critical habitat within the San Francisco and Blue River Complex, the action area contains 5.6 miles of loach minnow designated critical habitat. This equates to approximately 2% of the entire critical habitat unit. Therefore, the proposed action will not affect the role of the San Francisco and Blue River Complex relative to the conservation of the loach minnow and the overall proposed critical habitat designation.

Spikedace designated critical habitat

After reviewing the current status of the spikedace designated critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to destroy or adversely modify designated critical habitat. The Service makes this finding for the following reasons:

1. The Forest has identified suitable conservation measures (e.g., replanting of riparian vegetation) that will be incorporated into the proposed action, which will reduce impacts to the spikedace and its designated critical habitat.
2. Out of the total 235.0 stream miles of designated critical habitat within the San Francisco and Blue River Complex, the action area contains 5.6 miles of spikedace designated critical habitat. This equates to approximately 2% of the entire critical habitat unit. Therefore, the proposed action will not affect the role of the San Francisco and Blue River Complex relative to the conservation of the spikedace and the overall proposed critical habitat designation.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the U.S. Forest Service, Gila National Forest so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through

enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Mexican spotted owl

Amount or Extent of Take Anticipated

The Service is reasonably certain that the proposed action will result in incidental take of Mexican spotted owls in the form of harm and harassment. Injury, harm, or death from vehicular collisions is expected to be rare. The majority of incidental take from the proposed action will be in the form of short-term harassment. The Service anticipates that the proposed action will result in incidental take of Mexican spotted owls in the form of harassment due to potential for significant habitat alterations of Mexican spotted owl prey habitat. Owls experiencing short-term harassment may fail to successfully rear young in one or more breeding seasons, but will not likely desert the area because of a short-term disturbance (Delaney et al. 1999); harassment is measured as owls taken associated with a specific number of PACs.

The Service anticipates that the proposed action is reasonably certain to result in incidental take of Mexican spotted owls. However, it is difficult to quantify the number of individual owls taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is secretive and we rarely have information regarding the number of owls occupying a PAC and/or their reproductive status. For these reasons, the Service will attribute incidental take at the PAC level. This fits well with our current section 7 consultation policy which provides for incidental take if an activity compromises the integrity of an occupied PAC to an extent that the Service is reasonably certain that incidental take occurred (Service Memorandum, February 3, 1997). Actions outside PACs will generally not result in incidental take because we are not reasonably certain the owls are nesting and roosting in areas outside of PACs. The Service may modify this determination in cases when areas that may support owls have not been adequately surveyed and we are reasonably certain owls may be present; thus, the Service may assign incidental take in areas where PACs have not been designated.

The Service identified up to 15 PACs which may be affected by the Luna Restoration Project. Of these 15 PACs, 8 PACs will receive mechanical vegetation treatment, 15 PACs will undergo prescribed burning, with 7 PACs receiving a combination of these treatments. In addition, of these 15 PACs, 2 PACs will have some form of range improvement and 12 PACs will be affected by road construction or rehabilitation. However, this work will occur outside the breeding season and habitat will not be modified to the extent that there would be incidental take as a result of this aspect of the proposed action in these PACs.

The Service anticipates that incidental take may occur in the form of harassment in up to 4 PACs per year due to a single (i.e., one breeding season) or short-term (i.e., one to three breeding season) disturbance or habitat alteration associated with implementation of the proposed action. "Disturbance" is defined as a non-habitat altering action that disrupts or is likely to disrupt owl

behavior within the PACs and “habitat alteration” is considered a short-term loss of key habitat component. While the Service does not expect owls associated with 4 PACs to be taken in the form of harassment every year, the potential is there in any given year. The disturbance and short-term habitat modification generated by activities associated with the Luna Restoration Project are likely to interrupt, impede, or disrupt normal behavior patterns to the point that breeding and feeding activities may be impacted over the course of one to three breeding seasons.

Based on the best available information for the Mexican spotted owl, the habitat needs of the species, the description of the proposed action, and information regarding the status of the species within the action area, incidental take is authorized in the following scenarios:

1. Up to one individual PAC, with all associated owls, is harassed over the course of more than three breeding seasons as a result of the proposed action, as determined by monitoring protocol established in coordination with the Service
2. Up to four PACs, with all associated owls, are harassed in one year as a result of the proposed action, as determined by monitoring protocol established in coordination with the Service.
3. Up to two Mexican spotted owls are taken in the form of harm and/or direct fatality due to vehicular collision on average once every five years, for a fifteen-year period.

If this amount of take is exceeded (as stated above), then as provided in 50 CFR Section 402.16, reinitiation of formal consultation would be required. Following the discovery of two fatalities, the Service will re-assess the project with the Forest Service and determine how to reduce fatalities in an effort to reduce exceedance of take in the form of harm.

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Mexican spotted owl.

Reasonable and Prudent Measures

Reasonable and prudent measures, and implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the action. In addition to the Conservation Measures already proposed as part of the project description, the Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Mexican spotted owl:

1. The Forest will conduct all activities in a manner that will minimize adverse effects to the Mexican spotted owl.
2. The Forest will conduct all activities in a manner that will minimize modification and loss of Mexican spotted owl habitat.
3. The Forest will monitor the impacts of mechanical thinning, prescribed burning, and associated actions to the Mexican spotted owl affected by the Luna Restoration Project.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Forest Service and their employees, contractors, or subcontractors must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 1:

- 1.1. The Forest Service shall avoid activities within 0.25 mile of PACs during the breeding season (March 1 to August 31) that could result in disturbance to nesting owls. If the Forest Service determines through protocol surveys that spotted owls are not nesting the year of the proposed activity or locates a nest and is able to buffer the breeding owls from noise throughout the breeding season, then this restriction would not apply. Other options include documenting topographic buffers in specific PACs or using noise tampering technology to reduce noise impacts.
- 1.2. Any Forest Service management activities within PACs and restricted/recovery habitat shall be coordinated and implemented to reduce potential disturbance to Mexican spotted owls. For example, where possible, prescribed burning associated with aspen restoration or earth moving associated with channel restoration will be coordinated with overall PAC burning activities in order to minimize the frequency and duration of operations within and immediately adjacent to these areas.
- 1.3. The Forest Service, in coordination with the Service, shall develop contingency plans in the event of new PACs being established or PAC boundary modifications due to owl movement or habitat changes. These contingency plans should be developed prior to project implementation in these areas and within three months of discovery of new information. Flexibility shall be built into the project (including task orders) so that as owls move or new sites are located, project activities can be modified to accommodate these situations.
- 1.4. The Forest Service shall ensure that all contractors associated with thinning and burning activities, transportation of equipment and forest products, research, or restoration activities are briefed on the Mexican spotted owl, know to report sightings and to whom, avoid harassment of the owl, and are informed as to who to contact and what to do if a Mexican spotted owl is incidentally injured, killed, or found injured or dead on the Gila National Forest. If an owl fatality is discovered, the Service Mexican spotted owl lead will be contacted as soon as possible.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 2:

- 2.1. The Forest Service shall coordinate management activities within PACs and restricted/recovery habitat in order to reduce effects to habitat from multiple entries that can disturb owls and result in adverse effects to habitat.
- 2.2. The Forest Service shall meet annually with the Service to discuss the upcoming year's thinning and burning plans in Mexican spotted owl habitat and review the past year's thinning and burning activities in owl habitats.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 3:

- 3.1. The Forest Service shall monitor the effects of mechanical thinning and prescribed burning on owl occupancy and reproduction, and key habitat components (as defined in the Revised Mexican spotted owl Recovery Plan, table C.2) within an appropriate number of treatment and reference PACs, as determined in coordination with the Service. The Forest Service shall also monitor the effects of prescribed fire only treatments on owl occupancy and reproduction, and key habitat components within an appropriate number of treatment and reference PACs, as determined in coordination with the Service. Owl occupancy and reproductive data shall be collected for at least two years prior to treatment and two years post-treatment. Vegetation data should be collected pre-treatment and at defined intervals post-treatment. The specific plan development, selection of PACs, and monitoring framework shall be developed in coordination with the Service and Forest Service District Staff to ensure coordination with other projects and monitoring efforts. The monitoring plan shall be designed and implemented to evaluate the effects of thinning and prescribed fire on owl occupancy and reproduction, and retention of or movement toward desired habitat conditions within PACs, as defined in the 2012 MSO Recovery Plan (Service 2012a).
- 3.2. The Forest Service shall monitor the impacts of incidental take resulting from implementation of the proposed action and report these findings to the Service. Incidental take monitoring shall include information such as when the project was implemented, whether the project was implemented as proposed and analyzed in this biological opinion (including conservation measures and best management practices), breeding season(s) over which the project occurred, relevant owl survey information, and any other pertinent information about the project's effects on the species.
- 3.3. Annual reports will describe actions taken under this proposed action and impacts to the owl and its critical habitat. The annual report shall be sent to the New Mexico Ecological Services field office and the Mexican spotted owl species lead by March 1 of each year following implementation of the proposed action (i.e., activities performed during 2019 will be included in the March 1, 2020, report).

Narrow-headed gartersnakeAmount or Extent of Take

The Service is reasonably certain that the proposed action will result in incidental take of narrow-headed gartersnakes in the form of harm and harassment. Injury, harm, or death due to heavy equipment use is expected to be rare, but may occur if gartersnakes are present within the areas where stream improvements will occur. Harassment may occur through displacement from optimal habitat, reduction in prey base as a result of sediment input into the stream, and potential disruption of reproductive activities.

It is unknown exactly how many gartersnakes may be present in the footprint of construction activities associated with stream improvements or that may be impacted by indirect effects from vegetation treatments, but we expect it to be fewer than 4 individuals based on the following reasons: 1) one to three gartersnakes have been found within five miles of the action area during surveys conducted in 2005, 2010, and 2016; 2) the action area contains potential habitat for the gartersnake that may be used as sheltering or foraging sites; and, 3) the timing of activities within the action area may overlap with the time of year when females give birth and if the area is used by females for gestation and birth, several young of the year may still be present in the action area. Therefore, we estimate that no more than 4 individuals, including adults and neonates, will likely be present in the action area prior to project implementation. In addition, since conservation measures are designed to reduce take from direct crushing or killing of individual gartersnakes, we anticipate that fewer than two of those individuals may be present in the action area during construction activities and may be subject to injury or death.

Based on the best available information for the narrow-headed gartersnake, the habitat needs of the species, the description of the proposed action, and information regarding the status of the species within the action area, incidental take is authorized in the following scenario:

1. Up to four individuals present within the action area which may require relocation, as indicated by survey results.
2. Up to two individuals taken in the form of harm and/or direct fatality due to the proposed action, as indicated by monitoring results.

If this amount of take is exceeded, then as provided in 50 CFR § 402.16, reinitiation of formal consultation would be required. Following the discovery of four individuals present in the action area which may require relocation and/or the discovery of greater than two fatalities, the Service will re-assess the project with the Forest Service and determine whether relocation efforts need to be re-evaluated in order to reduce exceedance of take in the form of harassment and/or how to reduce fatalities in order to reduce exceedance of take in the form of harm.

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the narrow-headed gartersnake.

Reasonable and Prudent Measures

Reasonable and prudent measures, and implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the action. In addition to the Conservation Measures already proposed as part of the project description, the Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the gartersnake:

1. The Forest will conduct all activities in a manner that will minimize adverse effects to the gartersnake.
2. The Forest will conduct all activities in a manner that will minimize modification and loss of gartersnake habitat.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service and their employees, contractors, or subcontractors must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 1:

- 1.1. The Forest Service will conduct pre-construction surveys for gartersnakes by permitted individuals. The surveys will be coordinated, in writing, with the New Mexico Ecological Services Field Office on recommended survey intensity, duration, and extent. Surveys for gartersnakes could include a combination of visual encounter surveys, both intense, focused (walking both banks, searching in vegetation, moving substrate where possible) and secondary, incidental (while surveying for other species including fish and frog surveys), and would also include the use of minnow traps placed along water edges. Surveying would extend at least 200 meters up and downstream from the bridge site. Surveyors will deploy minnow traps overnight for at least one night.

- 1.2. The Forest Service will install instream block nets upstream and downstream of the construction area with connected drift fencing extending upland (similar to those described and used by Pittenger 2015). The Forest Service will intensively survey the area inside the fencing prior to construction and bridge rehabilitation. If the surveys detect gartersnakes within the fenced area, surveyors will place gartersnakes outside of the construction area into suitable habitat.
- 1.3. The Forest Service will monitor the area to determine if gartersnakes are attempting to re-enter the construction site during project implementation. The Forest Service will move gartersnakes away from the construction site if they are detected in the fenced area or adjacent to the block nets or drift fencing.

The Service establishes the following Terms and Conditions to implement Reasonable and Prudent Measure 2:

- 2.1. Construction completed during the dry or base flow season (typically prior to or after August and September) to reduce impacts to surface water quality within the work site and downstream locations.

Loach minnow

Amount or Extent of Take

The Service is reasonably certain that the proposed action will result in incidental take of loach minnows in the form of harm and harassment. Harm and harassment are anticipated to result from trapping, capture, and translocation of loach minnows out of the action area. Injury, harm, or death due to heavy equipment use is expected to be rare, but may occur if loach minnow avoid detection or capture during pre-construction surveys and trapping or if loach minnow or if loach minnow evade the block nets and enter the action area where stream improvements will occur. Harassment may occur through displacement from optimal habitat, reduction in prey base as a result of sediment input into the stream, and potential disruption of reproductive activities.

It is unknown exactly how many loach minnow may be present in the footprint of construction activities associated with stream improvements or that may be impacted by indirect effects from vegetation treatments; however, based on the best available data (Forest Service 2006, 2007, 2008, 2010, and 2011), we expect it to be fewer than 45 individuals based on the following reasons: 1) an average of 18 loach minnow have been located in areas of Dry Blue Creek within the action area based on surveys from 2006, 2007, 2008, 2010, and 2011; 2) the average density of loach minnow within the survey areas is approximately 18 individuals per linear stream mile (based on the above survey results within a 1.05 stream mile footprint); 3) the action area contains 2.25 stream miles of critical habitat considered suitable for the loach minnow; and, 4) based on the 2.25 miles of loach minnow critical habitat considered suitable within the action area, it is anticipated that approximately 41 loach minnow may be present within the action area.

Therefore, with the incorporation of some uncertainty in our calculations, we estimate that no more than 45 individuals, will likely be present in the action area prior to project implementation.

Based on the best available information for the loach minnow, the habitat needs of the species, the description of the proposed action, and information regarding the status of the species within the action area, incidental take is authorized in the following scenario:

1. Up to 45 individuals present within the action area, as indicated by survey results during electrofishing and relocation efforts

Effect of Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the loach minnow. Following the discovery of 45 individuals present in the action area during electrofishing and relocation efforts, the Service will re-assess the project with the Forest Service and determine whether electrofishing and relocation efforts need to be re-evaluated in order to reduce exceedance of take in the form of harassment.

Reasonable and Prudent Measures

Reasonable and prudent measures, and implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the action. Based on the Conservation Measures already proposed as part of the project description, the Service does not believe that reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the loach minnow.

Terms and Conditions

Based on the Conservation Measures already proposed as part of the project description, the Service does not believe that reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the loach minnow; therefore, there are no associated terms and conditions for the loach minnow.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Mexican spotted owl

1. The Forest Service should work with the Service to conduct Mexican spotted owl surveys over the next several years to attempt to determine how owls modify their territories in

response to wildland fires on the Gila Nation Forest. This information will aid us in understanding the short- and long-term impacts of fire on the owl, and its subsequent effect on the status of the species in the UGM Recovery Unit. Surveys should be coordinated with the Service prior to implementation of any project.

2. The Forest Service should continue to work with the Service to design forest restoration treatments across the Gila National Forest that protects existing nest/roost habitat from high-severity, stand-replacing fire, and enhance existing or potential habitat to aid in sustaining Mexican spotted owl habitat across the landscape. PACs can be afforded substantial protection from wildland fire by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost habitat.

Narrow-headed Gartersnake

1. The Forest Service should continue to cooperate with New Mexico Department of Game and Fish (NMDGF), the Service, and other parties, in efforts to remove all nonnative species affecting the gartersnake and take measures to prevent reoccurrence of nonnative species from identified recovery stream segments.
2. The Forest Service should continue to cooperate with NMDGF, the Service, and other parties to secure, renovate, and maintain streams in order to provide additional habitat for native fish prey species and gartersnakes.
3. Continue to participate in surveys for gartersnakes and participate in renovation of streams within the historic range of the gartersnake to restore streams to a native fish and amphibian fauna.
4. Implement other actions that contribute to recovery and conservation of gartersnakes on the Gila National Forest.

Loach Minnow

1. The Forest Service should continue to cooperate with other parties, in efforts to remove all nonnative species affecting the loach minnow and implement measures to prevent reoccurrence of nonnative species from identified recovery stream segments.
2. In cooperation with other parties, the Forest Service should continue efforts to secure, renovate, and maintain streams in order to provide additional habitat for the loach minnow and other native fish.
3. The Forest Service should continue to participate in surveys for loach minnow and participate in renovation of streams within the historic range of the loach minnow to restore streams to a native fish and other native aquatic wildlife fauna.
4. Implement other actions that contribute to recovery and conservation of the loach minnow throughout all streams on Forest Service land within the historical range of the loach minnow.

RE-INITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not

considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

LITERATURE CITED

- Arizona Game and Fish Department. 2002. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona, USA.
- Arizona Game and Fish Department. 2013. Section 10 Annual Permit Report for Loach minnow and Spikedace.
- Barber, W. E. and W.L. Minckley. 1983. Feeding Ecology of a Southwestern Cyprinid Fish, The Spikedace, *Meda Fulgida*, Girard. *The Southwestern Naturalist* 28(I):33-40
- Belsky, A.J., A. Matzke and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* 54(I):4 19-431 .
- Boundy, J. 1994. *Thamnophis rufipunctatus*. Color and size. *Herpetological Review* 25(3):126-127.
- Brennan, T. C., P. C. Rosen, and L. Hellekson. 2009. *Diadophis punctatus regalis* (regal ring-necked snake) diet. *Sonoran Herpetologist* 22(11): 123.
- Brennan, T. C. and A. T. Holycross. 2006. A Field Guide to Amphibians and Reptiles in Arizona. Arizona Game and Fish Department, Phoenix. 150 pp.
- Breshears, D.D., N.S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J.H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyers. 2005. Regional vegetation die-off in response to global-change-type drought. *Proceedings of the National Academy of Sciences, USA (PNAS)* 102(42): 15144-48.
- Cook, E.R., C.A. Woodhouse, C.M. Eakin, D.M. Meko, and D.W. Stahle. 2004. Long-term aridity changes in the western United States. *Science* 306: 1015-1018.
- Courtney, S.J., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Guitierrez, J.M. Marzluff, and L. Sztukowski. 2004. Scientific Evaluation of the Status of the Northern Spotted Owl. Sustainable Ecosystems Institute, Portland, Oregon. 508 pp.
- Degenhardt, W.G., C.W. Painter, and A.H. Price. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico Press, Albuquerque. pp. 317-319.
- Delaney, D. K., T. G. Grubb, and P. Beier. 1999. Activity patterns of nesting Mexican spotted owls. *Condor* 101 :42-49.

- de Queiroz, A. 2003. Testing an adaptive hypothesis through context-dependence: effects of water depth on foraging behavior in three species of garter snakes. *Ethology* 109:369-384.
- Dettinger, M.D. and D.R. Cayan. 1995. Large scale atmospheric forcing of recent trends toward early snowmelt runoff in California. *Journal of Climate* 8: 606-623.
- Dettinger, M.D. and H.F. Diaz. 2000. Global characteristics of streamflow seasonality and variability. *Journal of Hydrometeorology* 1: 289-310.
- Drost, C. A., Paxton, E. H., Sogge, M. K., and M. J. Whitfield. 2003. Food habits of southwestern willow flycatchers during the nesting season. *Studies in Avian Biology* 26:26-96.
- Drummond, H. and C. Macías Garcia. 1983. Limitations of a generalist: a field comparison of foraging snakes. *Behaviour* 108(1/2):23-43.
- Durst, S.L., Sogge, M.K., Stump, S.D., Walker, H.A., Kus, B.E., and Sferra, S.J., 2008, Southwestern willow flycatcher breeding sites and territory summary-2007: U.S Geological Survey Open-File Report 2008-1303, 31 p.
- Ernst, C. H. and E. M. Ernst. 2003. *Snakes of the United States and Canada*. Smithsonian Books, Washington, D. C. xi + 668 p.
- Etzel, K. E., T. C. Theimer, M. J. Johnson, and J. A. Holmes. 2014. Variation in prey delivered to common black-hawk (*Buteogallus anthracinus*) nests in Arizona drainage basins. *Journal of raptor Research* 48(1):54-60.
- Fleaharty, E. D. 1967. Comparative ecology of *Thamnophis elegans*, *T. cyrtopsis*, and *T. rufipunctatus* in New Mexico. *The Southwestern Naturalist* 12(3):207-229.
- Forest Service. 2018. Biological Assessment for the Luna Restoration Project. Prepared by Timothy Hendricks. Quemado Ranger District, Gila National Forest.
- Gutierrez, R. J., A. B. Franklin, and W. S. LaHaye. 1995. Spotted Owl (*Strix occidentalis*). *The birds of North America*. The Academy of Natural Sciences Philadelphia, and The American Ornithologists Union, Washington, D.C. No. 179. 28 pp.
- Hibbitts, T. J. and L. A. Fitzgerald. 2005. Morphological and ecological convergence in two natracine snakes. *Biological Journal of the Linnean Society* 85:363-371.
- Hellekson, L. 2012. Interview with Lyndsay Hellekson, Wildlife Biologist, Gila National Forest, Supervisor's Office with supplementary field notes. (February 2, 2012).

- Hellekson, L. 2013. Public comment on proposed rule to list the northern Mexican gartersnake and narrow-headed gartersnake as threatened species under the Endangered Species Act. 5 pp.
- Holycross, A. T., W. P. Burger, E. J. Nigro, and T. C. Brennan. 2006. Surveys for *Thamnophis eques* and *Thamnophis rufipunctatus* along the Mogollon Rim and New Mexico. A Report to Submitted to the Arizona Game and Fish Department. 94 pp.
- Horton, S.P. and R.W. Mannan. 1988. Effects of prescribed fire on snags and cavity-nesting birds in Southeastern Arizona pine forests. *Wildlife Society Bulletin* 16(1):37-44.
- Intergovernmental Panel on Climate Change (IPCC). 2007. Summary for policy makers. In: *Climate Change 2007: The physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Quin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available at <http://www.ipcc.ch/>.
- Jameson, D.A. 1967. The Relationship of Tree Overstory and Herbaceous Understory Vegetation. *Journal of Forestry* 20(4):247-249.
- Jennings, R. and B. Christman. 2012. Dry and wet season habitat use of the narrow-headed gartersnake, *Thamnophis rufipunctatus*, in southwestern New Mexico. Final Report submitted to Share with Wildlife, New Mexico Department of Game and Fish. 34 pp.
- Lopez, M. 2010. E-mail correspondence from Mike Lopez, Fish Program Manager, Arizona Game and Fish Department (January 29, 2010; 1051 hrs.).
- Miller, R.R. 1961. Man and the changing fish fauna of the American Southwest. *Papers of the Michigan Academy of Science, Arts and Letters* 46:365-404.
- Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix. Pages 156-159, 170-171.
- Moore, M. M., W.W. Covington, and P. Z. Fule. 1999. Evolutionary environment, reference conditions, and ecological restoration: A southwestern ponderosa pine perspective. *Ecological Applications* 9(4): 1266-1277.
- Mueller, R.C., C.M. Scudder, M.E. Porter, R.T. Trotter III, C.A. Gehring and T.G. Whitham. 2005. Differential tree mortality in response to severe drought: Evidence for long-term vegetation shifts. *Journal of Ecology* 93(6): 1085-1093.
- New Mexico Department of Game and Fish. 1996. Threatened and endangered species of New Mexico - 1996 biennial review and recommendations. New Mexico Department of Game and Fish, Santa Fe, New Mexico, USA.

- New Mexico Department of Game and Fish. 2015. Section 10 Annual Permit Report for Chihuahua chub, Chiricahua leopard frog, Colorado pikeminnow, Gila chub, Gila trout, Headwater chub, Loach minnow, Pecos gambusia, Razorback sucker, Socorro isopod, and Spikedace.
- NHNM Species Information (NHNM). From Natural Heritage New Mexico. 2019. NMBiotics Database. Museum of Southwestern Biology, University of New Mexico, Albuquerque, NM. Online: <https://nhnm.unm.edu>. Accessed on February 13, 2019.
- Nowak, E. 2006. Monitoring surveys and radio-telemetry of narrow-headed gartersnakes (*Thamnophis rufipunctatus*) in Oak Creek, Arizona. Final Report to the Arizona Game and Fish Department. 40 pp.
- Nowak, E. M. and M. A. Santana-Bendix. 2002. Status, distribution, and management recommendations for the narrow-headed garter snake (*Thamnophis rufipunctatus*) in Oak Creek, Arizona. Final Report to the Arizona Game and Fish Department. Heritage Grant I99007. 57 pp.
- Painter, C. W. and T. J. Hibbitts. 1996. *Thamnophis rufipunctatus*. Maximum size. Herpetological Review 27(3):147.
- Propst, D. L., K.R. Bestgen, and C.W. Painter. 1988. Distribution status, biology, and conservation of the loach minnow (*Tiaroga cobitis*) in New Mexico. Endangered Species Report 17. U.S. Fish and Wildlife Service, Albuquerque, New Mexico, USA.
- Propst, D. L. and K.R. Bestgen. 1991. Habitat and biology of the loach minnow, *Tiaroga cobitis*, in New Mexico. Copeia 1991:29-38.
- Propst, D.L. 1999. Threatened and Endangered Fishes of New Mexico. New Mexico Department of Game and Fish, Technical Report Number
- Randall-Parker, T. and R. Miller. 2002. Effects of prescribed fire in ponderosa pine on key wildlife habitat components: preliminary results and a method for monitoring. Pgs. 823-834 In USDA Forest Service Gen. Tech. Rep. PSW-GTR-181.
- Reiners, W.A., W.L. Baker, J.S. Baron, D.M. Debinski, S.A. Elias, D.B. Fagre, J.S. Findlay, L.O. Mearns, D.W. Roberts, T.R. Seastedt, T.J. Stohlgren, T.T. Veblen, and F.H. Wagner. 2003. Natural Ecosystems 1: The Rocky Mountains (pp. 145-184). /n Wagner, F.H. (Ed.), Preparing for Climate Change: Rocky Mountain/Great Basin Regional Assessment Team for the U.S. Global Change Research Program. Utah State University. 240 pp
- Rosen, P.C. and C.R. Schwalbe. 1988. Status of the Mexican and narrow-headed gartersnakes (*Thamnophis eques megalops* and *Thamnophis rufipunctatus rufipunctatus*) in Arizona.

- Unpublished report from Arizona Game and Fish Department (Phoenix, Arizona) to U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- Rossman, D. A., N. B. Ford, and R. A. Seigel. 1996. The garter snakes evolution and ecology. University of Oklahoma Press. Norman.
- Saab, V., L. Bate, J. Lehmkuhl, B. Dickson, S. Story, S. Jentsch, and W. Block. 2006. Changes in downed wood and forest structure after prescribed fire in ponderosa pine forests. Pgs. 477-487 In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management-How to measure success: conference proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Smith, SJ, T. Wigley, and J.A. Edmonds. 2000. A new route toward limiting climate change? Science 290 (5494): 1109-1110.
- Springer, J. D., A. E. M. Waltz, P. Z. Fule, M. M. Moore, and W.W. Covington. 2001. Seeding versus natural regeneration: A comparison of vegetation change following thinning and burning in ponderosa pine. In R. K. Vance, C. B. Edminster, W.W. Covington, and J. A. Blake, comps. 2001. Ponderosa pine ecosystems restoration and conservation: Steps toward stewardship. April 25-27, 2000, Flagstaff, AZ. Proceedings RMRS-P-22. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.
- Stewart, I.T., D.R. Cayan, and M.D. Dettinger. 2004. Changes in snowmelt runoff timing in western North American under a "business as usual" climate change scenario. Climate Change 62: 217-232.
- Sublette, J.E., M.D. Hatch, and M.S. Sublette. 1990. The fishes of New Mexico. University of New Mexico Press, Albuquerque, NM.
- U.S. Fish and Wildlife Service. 1986. Endangered and threatened wildlife and plants; final rule to determine *Meda fulgida* to be a threatened species without critical habitat. Federal Register 51:23769- 23781.
- U.S. Fish and Wildlife Service. 1991. Loach minnow (*Tiaroga cobitis*) recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- U.S. Fish and Wildlife Service (Service). 1993. Endangered and threatened wildlife and plant: final rule to list the Mexican spotted owl as a threatened species. Federal Register 58: 14248-14271.
- U.S. Fish and Wildlife Service (Service). 1995 (1995a). Recovery Plan for the Mexican Spotted Owl: Vol. I. Albuquerque, New Mexico. 172 pp.

- U.S. Fish and Wildlife Service (Service). 1995 (1995b). Endangered and threatened wildlife and plants; Final rule determining endangered status for the Southwestern willow flycatcher (*Empidonax traillii extimus*). Federal Register 60(38):10,693–10,715.
- U.S. Fish and Wildlife Service (Service) 1996. Conducting section 7 consultation on Mexican spotted owls and critical habitat - policy. Memorandum from Regional Director to Arizona and New Mexico Field Supervisors, July 1, 1996. Albuquerque, NM. 3pp.
- U.S. Fish and Wildlife Service (Service). 1997. Endangered and threatened wildlife and plants; Final determination of critical habitat for the Southwestern willow flycatcher. Federal Register 62(140):39,129-39,147.
- U.S. Fish and Wildlife Service. 2000. Federal Register, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Spikedace (*Meda fulgida*) and the Loach Minnow (*Tiaroga cobitis*). Federal Register 65 (80) 24328-24372. April 25, 2000.
- U.S. Fish and Wildlife Service. 2002. Southwestern Willow Flycatcher Recovery Plan. U.S. Department of the Interior, U.S. Fish and Wildlife Service. Albuquerque, New Mexico, USA.
- U.S. Fish and Wildlife Service (Service). 2004. Endangered and threatened wildlife and plants; final designation of critical habitat for the Mexican Spotted Owl: final rule. Federal Register 69(168): 53182-53230.
- U.S. Fish and Wildlife Service. 2007. Federal Register, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Spikedace (*Meda fulgida*) and the Loach Minnow (*Tiaroga cobitis*). Vol. 72, No. 54, March 21, 2007. pp. 13356-13422.
- U.S. Fish and Wildlife Service. 2010. Endangered status and designation of critical habitat for spikedace and loach minnow; Proposed Rule. Federal Register/ Vol. 75, No. 208/ Thursday, October 28. Proposed Rules .
- U.S. Fish and Wildlife Service (Service). 2012 (2012a). Recovery plan for the Mexican spotted owl (*Strix occidentalis lucida*), First Revision. Albuquerque, New Mexico. 414 pp.
- U.S. Fish and Wildlife Service (Service) 2012 (2012b). Biological and Conference Opinion Continued Implementation of the LRMP for the Coconino National Forest of the Southwestern Region. Cons. #2012-F-0004, March 30, 2012. Albuquerque, NM. 196 pp.
- U.S. Fish and Wildlife Service. 2012 (2012c). Endangered and threatened wildlife and plants; endangered status and designation of critical habitat for spikedace and loach minnow; final rule. Federal Register 77: 10854 -10857.

- U.S. Fish and Wildlife Service (Service). 2013 (2013a). Endangered and threatened wildlife and plants; Designation of critical habitat for Southwestern Willow Flycatcher; Final rule. Federal Register 78(2):343-534.
- U.S. Fish and Wildlife Service (Service). 2013 (2013b). Endangered and threatened wildlife and plants; Designation of critical habitat for the Northern Mexican Gartersnake and Narrow-Headed Gartersnake, Proposed Rule. Federal Register 78(132):41550-41608
- U.S. Fish and Wildlife Service (Service). 2014 (2014a). Southwestern Willow Flycatcher (*Empidonax traillii extimus*) 5-Year Review: Summary and Evaluation. Albuquerque, New Mexico. 104 pp.
- U. S. Fish and Wildlife Service (Service). 2014 (2014b). Endangered and threatened wildlife and plants; threatened status for the northern Mexican gartersnake and narrow-headed gartersnake. Federal Register 79:38678-38746.
- USDA Forest Service (Forest Service). 2018. Biological Assessment for Luna Restoration Project June 2018. Prepared by Timothy Hendricks.
- Wilcox, J. 2015. E-mail correspondence John Wilcox (Zone Wildlife Biologist, Tonto National Forest, U.S. Forest Service). (December 4, 2015; 1532 hrs.).

Appendix A

Conservation Measures for Species Not Included in the Biological Opinion

Mexican gray wolf

- Coordination with the interagency field team to seasonally avoid treatments around active Mexican gray wolf dens.

Southwestern willow flycatcher

- Potential habitat near the Head of Ditch Campground will be surveyed to determine presence/absence of Southwestern Willow Flycatcher prior to implementing the proposed work on the irrigation diversion and road realignment. If flycatchers are detected, the action will not move forward until consultation is reinitiated.
- Prescribed fire will not be allowed to enter riparian habitat.
- During project activities, damage to riparian vegetation will be minimized to the extent possible.
- Riparian habitat that is disturbed as a result of the proposed activities will be restored by planting and/or seeding with native species.
- All equipment that will enter the water of Dry Blue Creek or the San Francisco River will be steam cleaned prior to use.
- No fuel or oil will be stored within the floodplain.
- Bank disturbance will be minimized to only what is needed to shape the banks where the motorized trail crossings occur and where the proposed irrigation diversion improvement is planned.

Spikedace

- The District Biologist or Forest Fishery Biologist will be present during implementation of the motorized trail crossing work to make sure that block nets remain in place and disturbance is minimized.
- Any riparian vegetation that is disturbed during implementation will be replaced with native riparian species after the project work is completed.
- Disturbed areas will be seeded with native species after the project work is completed.
- Riparian buffers will be established based on Forest Service best management practices to minimize sediment movement from any project work that occurs adjacent to riparian and stream habitat.
- The irrigation diversion improvement project and road realignment project located at the Head of Ditch Campground along the San Francisco River will be implemented during low flow periods. The San Francisco River downstream of this location typically becomes dewatered during a portion of the year and sediment produced by the project would not make it to designated critical habitat >20 miles downstream.